NASA

Aerospace Medicine and Biology
A Continuing Bibliography with Indexes

NASA SP-7011 (204)
March 1980

National Aeronautics and Space Administration

ACCESSION NUMBER RANGES

Accession numbers cited in this Supplement fall within the following ranges.

STAR (N-10000 Series)	N80-11999 - N80-14016
IAA (A-10000 Series)	A80-13129 - A80-17360

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NASA SP-7011(204)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 204)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in February 1980 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* (NASA SP-7011) lists 140 reports, articles and other documents announced during February 1980 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964; since that time, monthly supplements have been issued.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged in two major sections: *IAA Entries* and *STAR Entries*, in that order. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the slight variation in citation appearances.

Two indexes -- subject and personal author -- are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1980 Supplements.

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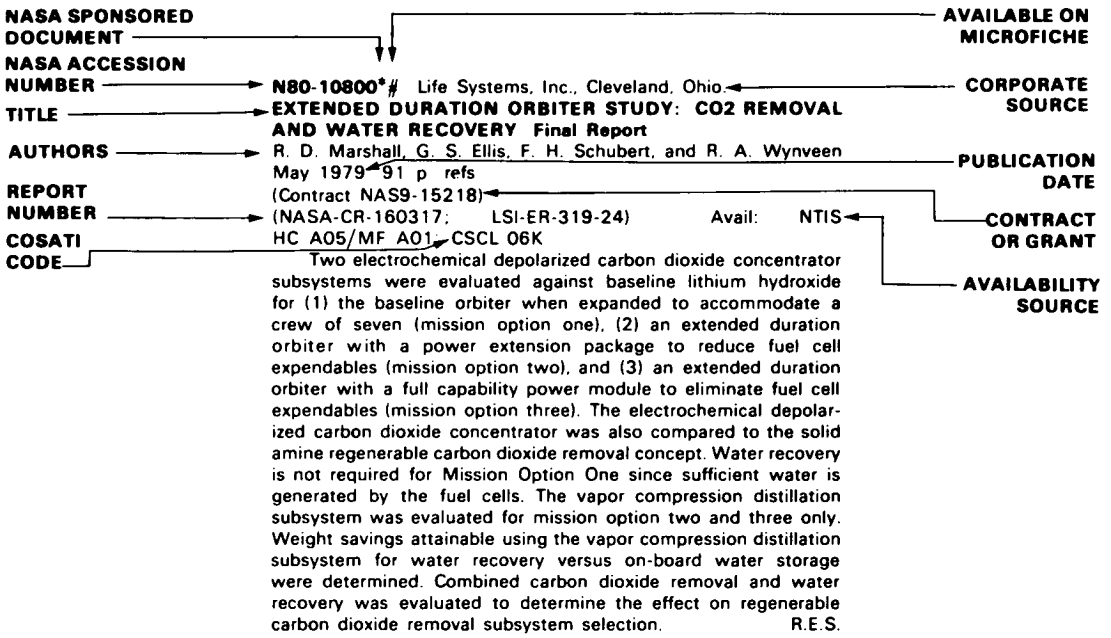

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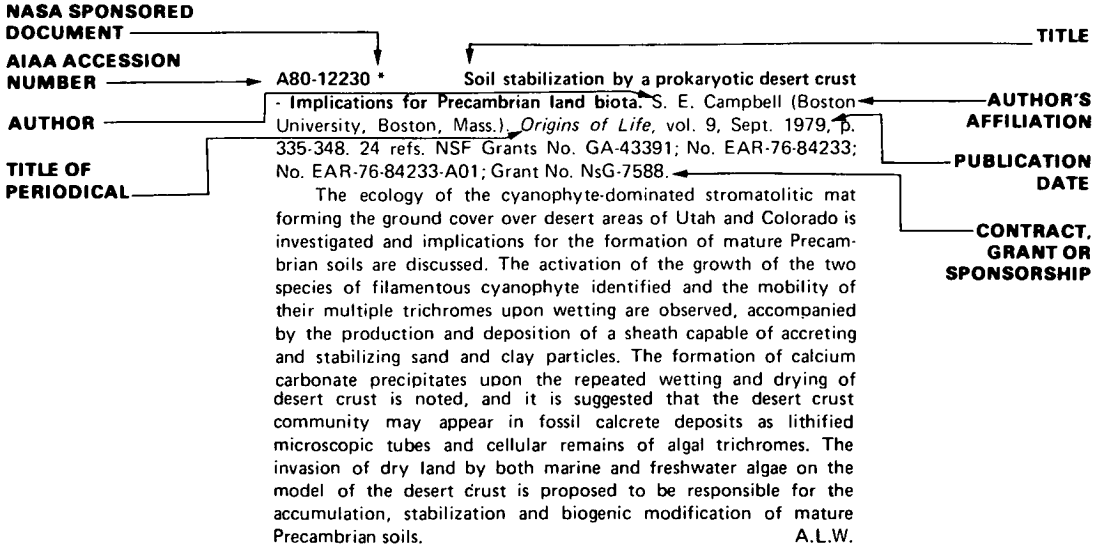

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 204)

MARCH 1980

IAA ENTRIES

A80-13186 **Innovations in transportation engineering and human factors (Verkehrstechnische Innovationen und menschliches Verhalten).** K. Steininger (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bonn, West Germany). *DFVLR-Nachrichten,* Nov. 1979, p. 35-39. In German.

The paper investigates the question of whether technical innovations always result in social benefits. Attention is given to the conflict between technical innovation and human failure. Innovations considered include semiconductor technology which influences communications, automatic control technology and microprocessor technology. Discussion covers the demands of modern transportation technology on man, human factors in traffic, and concepts for solving of the conflict. M.E.P.

A80-13216 **Electromagnetic absorption in multilayered cylindrical models of man.** H. Massoudi, C. H. Durney, P. W. Barber, and M. F. Iskander (Utah, University, Salt Lake City, Utah). *IEEE Transactions on Microwave Theory and Techniques,* vol. MTT-27, Oct. 1979, p. 825-830. 11 refs. Contract No. F41609-76-C-0025.

The absorption characteristics of multilayered cylindrical models of man irradiated by a normally incident electromagnetic plane wave are investigated. Numerical calculations for a specific skin-fat-muscle cylindrical model of man predict a layering resonance at 1.2 GHz with an average specific absorption rate (SAR) about double that calculated for the corresponding homogeneous model. The layering resonance frequency is found to be the same for incident waves polarized parallel and perpendicular to the cylindrical axis. The effects of layers on the whole-body absorption by man are determined by averaging the effects obtained for many combinations of skin and fat thicknesses. Absorption effects due to clothing are also investigated. (Author)

A80-13243 # **General characteristics of the rheological properties of the soft tissues of the human body using local cycling loading measurements and a simple phenomenological model of these properties (Obshchaia kharakteristika reologicheskikh svoistv miagkikh tkanei cheloveka po dannym izmerenii metodom lokal'nogo tsiklicheskogo nagruzheniia i prosteishaia fenomenologicheskaia model etikh svoistv).** E. V. Belaia (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *(Vsesoiuznaia Konferentsiia po Problemam Biomekhaniki, 2nd, Riga, Latvian SSR, Apr. 1979.) Mekhanika Kompozitnykh Materialov,* July-Aug. 1979, p. 737-741. In Russian.

A80-13263 **T-waves in the exercise ECG - Their location and occurrence.** R. A. Wolthuis (Medtronic, Inc., Minneapolis, Minn.), N. Keiser, J. R. Fischer, Jr. (USAF, School of Aerospace Medicine, Brooks AFB, Tex.), and A. Hopkirk. *IEEE Transactions on Biomedical Engineering,* vol. BME-26, Nov. 1979, p. 639-643. 12 refs.

The automated location of T-wave fiducial points in single lead exercise ECGs is facilitated by using R-wave peak to T-wave maximum and R-wave peak to T-wave ending intervals predicted from heart rate. Predictive equations for these intervals were developed; algorithms were subsequently designed and tested on 8380 averaged ECG beats from 146 patients. Of 6775 ECG beats with monophasic T-waves, 98 percent of the T-wave maximum and 96 percent of the T-wave ending fiducial points were correctly identified by these algorithms. The predictive equations and associated algorithms are discussed. (Author)

A80-13272 **Ergonomical studies about the superposition of control activity and mechanical vibration (Ergonomische Untersuchungen zur Superposition von Regeltätigkeiten und mechanischen Schwingungen).** R. Helbig and H. Luczak (Darmstadt, Technische Hochschule, Darmstadt, West Germany). *European Journal of Applied Physiology,* vol. 42, no. 2, 1979, p. 81-104. 59 refs. In German.

The effects of combined stresses due to control activity and vertical mechanical vibration on man are analyzed. The processes in the human being at those superposed stresses are shown in a deterministic way, starting from morphological and physiological facts that lead to a division of the organismic data processing in the fields of information reception, central information processing and output. Factorial laboratory experiments with combined stresses consisting of an ideal-typical compensatory-tracking task and mechanical vibration are discussed. It is determined that influences of vibration in regions of information reception and information output were found as well as thresholds for the performance reducing effects of mechanical vibrations. C.F.W.

A80-13273 **Effects and post-effects of two-hour exhausting exercise on composition and gas transport functions of blood.** D. Böning, W. Skipka, P. Heedt, W. Jenker, and U. Tibes (Köln, Deutsche Sporthochschule, Cologne, West Germany). *European Journal of Applied Physiology,* vol. 42, no. 2, 1979, p. 117-123. 22 refs.

A80-13274 **Seasonal variation in work performance and heart rate response to exercise - A study of 1,835 middle-aged men.** J. Erikssen (Rikshospitalet, Oslo, Norway) and K. Rodahl (Norwegian College of Physical Education, Oslo, Norway). *European Journal of Applied Physiology,* vol. 42, no. 2, 1979, p. 133-140. 8 refs.

A80-13322 **A procedure for electronically monitoring animal response parameters using the rotating wheel.** J. C. Spurgeon, R. A. Filipczak, R. E. Feher, and S. J. Sternik (FAA, National Aviation Facilities Experimental Center, Atlantic City, N.J.). *Journal of Combustion Toxicology,* vol. 6, Aug. 1979, p. 198-207. 10 refs.

A convenient method of quantitatively comparing aircraft interior materials according to their relative potential toxicities is to

place a small animal (rat) in a rotating wheel and measure the time from the onset of toxic gas to the animal's incapacitation. Because of the loss of visibility due to smoke, electronic monitoring of the rotating wheel is necessary. Tests were performed at the FAA's National Aviation Facilities Experimental Center using the thermal decomposition products first of a wool seat fabric, and then of a coated fabric (polyvinylchloride on cloth). The exact specifications of the rotating wheel assembly developed at the FAA's Civil Aeromedical Institute, as well as explicit descriptions of the behavior of the animals during the tests, supplemented by graphs, are presented. J.B.

A80-13372 # **Relationship between recovery and hypothermia induced by centrifugation in rats.** H. Fujiwara, E. Kamei, and I. Saito (Japan Air Self Defense Force, Aeromedical Laboratory, Tachikawa, Tokyo, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports,* vol. 20, June 1979, p. 1-20. 26 refs. In Japanese, with abstract in English.

The paper presents the relationship between recovery and hypothermia induced in rates by centrifugation. A total of 80 SLC-Sprague Dawley (SD) strain young male rats were exposed to centrifugation of 2G in the backward prone position G(-GX) for 15 to 60 min/day, and their core temperatures were measured before, after, and 30 to 90 min after the centrifuge exposure. It was found that (1) the core temperatures was about 38.0 C in the prerun control measurement, and it fell to temperatures in the 35.4 to 37.0 C range after daily 15 min exposure to centrifugation for periods from 3 to 10 weeks, (2) the core temperatures decreased more than higher initial core temperatures, and (3) the core temperatures recovered to almost normal levels within 30 min after centrifugation. A.T.

A80-13373 # **Effects of long-term repetitive exposure to centrifugation of 2G on developing rat.** E. Kamei, H. Fujiwara, and I. Saito (Japan Air Self Defense Force, Aeromedical Laboratory, Tachikawa, Tokyo, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports,* vol. 20, June 1979, p. 21-47. 15 refs. In Japanese, with abstract in English.

Investigation of the effect of centrifugation on body weight and length, tail length, bone development by biometry, food and water intake, and daily amount of feces of rats is presented. 80 male rats were exposed to centrifugal forces of 2G for daily periods of 15 min expanded weekly by 5 min for 7 to 70 days. It was found that (1) the body weight was consistently lower than that of the controls, and that the centrifuged rats showed on average a smaller body and tail length compared to each control group, (2) compared to the control group, the length of the femur and tibia were decreased and the midshaft diameter of both bones were decreased by centrifugation, (3) daily consumption of food and water in the rats exposed for 56 and 70 days decreased compared to their respective control groups, but in the 42 day exposure group the food consumption was equal or slightly less than that of the control group, and (4) the mean amount of feces in the rats exposed for 56, 70, and 42 days were almost similar to respective control groups. A.T.

A80-13374 # **Effects of cold exposure on circadian rhythm of body temperature in rats and rabbits.** H. Osada, E. Sakaguchi, H. Maru, R. Yurugi (Japan Air Self Defense Force, Aeromedical Laboratory, Tachikawa, Tokyo, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports,* vol. 20, June 1979, p. 49-58. 7 refs. In Japanese, with abstract in English.

A study of the effects of cold exposure on the circadian rhythm of the body temperature in rats and rabbits is presented. 5 rabbits were exposed outdoors during winter for 48 hr, and 5 rats were placed in a cold room (5 plus or minus 1 C) for 2 months. Body temperatures of the animals were measured every one or two hours, and the circadian rhythm of the body temperature was analyzed by the cosinor method in which the mean value, amplitude, and the phase shift of the body temperature alteration during 24 hr were mathematically expressed. Both the cold and warm acclimatized rats showed approximately the same pattern in the circadian diagram; acutely cold exposed rabbits exhibited reduced amplitude in cosinor diagram in rectal, subcutaneous and skin temperature as compared with the warm acclimatized rabbits and a reversed phase with the environmental air temperature and human circadian pattern. A.T.

A80-13451 **Biological investigations carried out in balloons.** H. Planel, J. P. Soleilhavoup, and G. Gasset (Toulouse III, Université, Toulouse, France). In: Scientific ballooning; Proceedings of the Symposium on the Scientific Use of Balloons and Related Technical Problems, Innsbruck, Austria, May 29-June 10, 1978. Oxford, Pergamon Press, Ltd., 1979, p. 187-194. 12 refs.

The French program of balloon-borne experiments on the effects of cosmic rays on living organisms is reviewed. Past experiments on paramecium and plant growth rates following specimen recovery and the effects of heavy ions, which would be encountered in long-term space flights, on yeast mutations and the nervous system of rats, which were conducted using a thermally-regulated container in a balloon flying at 120,000 feet for six to nine hours, are indicated. Recent experiments using a remote-controlled apparatus to study the immediate response of paramecium growth kinetics to cosmic radiation are presented, noting the observed increased cell growth rates upon cosmic ray exposure, and studies of cosmic ray effects on drosophila mutations and genetic recombination are reported. Future experiments planned for a 20-h transmediterranean balloon flight are presented which are intended to study cosmic ray effects on Artemia salina and tobacco seed development, and drosophila genetic recombination rates. A.L.W.

A80-13476 # **Investigation of thermoregulatory mechanisms (Issledovanie mekhanizmov termoreguliatsii).** Iu. N. Chusov (Vladimirskii Gosudarstvennyi Pedagogicheskii Institut, Vladimir, USSR). *Fiziologiia Cheloveka,* vol. 5, Sept.-Oct. 1979, p. 827-833. 37 refs. In Russian.

The paper investigates the effect of cooling in ice water on the behavior of certain psychophysiological processes in man. The study establishes the dependence of the trend and value of the arising changes on total heat loss, as well as on the body resistivity and the regime of voluntary muscular activity during the cooling period. A critical value of cooling load is determined which significantly reduces the level of the processes considered. S.D.

A80-13477 # **Water-electrolyte metabolism and the function of human kidneys at mountain altitudes (Vodno-solevoi obmen i funktsiia pochek cheloveka v usloviiakh vysokogor'ia).** V. I. Korol'kov, M. A. Dotsenko, A. I. Grigor'ev, and G. I. Kozyrevskaia. *Fiziologiia Cheloveka,* vol. 5, Sept.-Oct. 1979, p. 849-854. 26 refs. In Russian.

A80-13505 **Difference between end-tidal and arterial P/CO2/ in exercise.** N. L. Jones, D. G. Robertson, and J. W. Kane (McMaster University, Hamilton, Ontario, Canada). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 47, Nov. 1979, p. 954-960. 14 refs.

A80-13506 * **Plasma volume during stress in man - Osmolality and red cell volume.** J. E. Greenleaf, V. A. Convertino, and G. R. Mangseth (NASA, Ames Research Center, Biomedical Research Div., Moffett Field, Calif.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 47, Nov. 1979, p. 1031-1038. 30 refs.

The purpose was (1) to test the hypothesis that in man there is a range of plasma osmolality within which the red cell volume (RCV) and mean corpuscular volume (MCV) remain essentially constant and (2) to determine the upper limit of this range. During a variety of stresses - submaximal and maximal exercise, heat and altitude exposure, +Gz acceleration, and tilting - changes in plasma osmolality between -1 and +13 mosmol/kg resulted in essentially no change in the regression of percent change in plasma volume (PV) calculated from a change in hematocrit (Hct) on that calculated from a change in Hct + hemoglobin (Hb), i.e., the RCV and MCV were constant.

Factors that do not influence RCV are the level of metabolism, heat exposure at rest, and short-term orthostasis (heat-to-foot acceleration). Factors that may influence RCV are exposure to high altitude and long-term orthostasis (head-up tilting). Factors that definitely influence RCV are prior dehydration and extended periods of stress. Thus, either the Hct or the Hct + Hb equations can be used to calculate percent changes in PV under short-term periods of stress when the change in plasma osmolality is less than 13 mosmol/kg. (Author)

A80-13507 Thermogenic control during exercise in a cold environment. S.-I. Hong (John B. Pierce Foundation Laboratory, New Haven, Conn.) and E. R. Nadel (Yale University, New Haven, Conn.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 47, Nov. 1979, p. 1084-1089. 15 refs. Grant No. NIH-ES-00354.

A80-13526 # Foundation of hyperbaric physiology (Osnovy giperbaricheskoi fiziologii). G. L. Zal'tsman, G. A. Kuchuk, and A. G. Gurgenidze. Leningrad, Izdatel'stvo Meditsina, 1979. 320 p. 344 refs. In Russian.

The book outlines achievements in human and animal physiology under conditions of elevated pressures of gaseous and aqueous environments. Two problem areas are discussed in detail: the physiological characteristics of hyperbaric habitat, and the functional state of the organism in different hyperbaric environments. Attention is given to the effect, on man and animals, of hyperbaric oxygen, air, helium-oxygen and argon-oxygen environments during short- and long-term exposures under low, medium, high and superhigh pressures. The observed shifts are examined on the organism, organ, and cellular levels. Practical application of respiratory gas mixtures under pressure is also discussed. S.D.

A80-13548 * Amino acids in the Yamato carbonaceous chrondrite from Antarctica. A. Shimoyama, C. Ponnamperuma (Maryland, University, College Park, Md.), and K. Yanai (National Institute of Polar Research, Tokyo, Japan). *Nature,* vol. 282, Nov. 22, 1979, p. 394-396. 16 refs. Grant No. NGR-21-002-317.

Evidence for the presence of amino acids of extraterrestrial origin in the Antarctic Yamato carbonaceous chrondrite is presented. Hydrolyzed and nonhydrolyzed water-extracted amino acid samples from exterior, middle and interior portions of the meteorite were analyzed by an amino acid analyzer and by gas chromatography of N-TFA-isopropyl amino acid derivatives. Nine protein and six nonprotein amino acids were detected in the meteorite at abundances between 34 and less than one nmole/g, with equal amounts in interior and exterior portions. Nearly equal abundances of the D and L enantiomers of alanine, aspartic acid and glutamic acid were found, indicating the abiotic, therefore extraterrestrial, origin of the amino acids. The Antarctic environment and the uniformity of protein amino acid abundances are discussed as evidence against the racemization of terrestrially acquired amino acids, and similarities between Yamato amino acid compositions and the amino acid compositions of the Murchison and Murray type II carbonaceous chrondrites are indicated. A.L.W.

A80-13549 * Quantification of monocarboxylic acids in the Murchison carbonaceous meteorite. J. G. Lawless (NASA, Ames Research Center, Extraterrestrial Research Div., Moffett Field, Calif.) and G. U. Yuen (Arizona State University, Tempe, Ariz.). *Nature,* vol. 282, Nov. 22, 1979, p. 396-398. 30 refs.

The abundances of some of the straight- and branched-chain isomers of the monocarboxylic acids found in the Murchison carbonaceous chondrite are determined. Monocarboxylic acids extracted from a crushed sample of Murchison interior were quantified by means of gas chromatography and mass spectroscopy after a spiking solution of deuterated analogues of 11 carboxylic acids had been added. Monocarboxylic acid abundances are found to range between 1.83 and 0.01 micromole/g, which is significantly higher than Murchison amino acid concentrations, and to decrease with increasing carbon number for both branched and unbranched molecules. The results are interpreted to support the abiotic extraterrestrial synthesis of monocarboxylic acids. Possible mechanisms leading to the equal synthesis of branched and each unbranched carboxylic acid with the same carbon number are considered, noting that the Fischer-Tropsch Type mechanism by itself is incapable of accounting for the observed distributions. A.L.W.

A80-13590 Microwaves - Effect on thermoregulatory behavior in rats. S. Stern, L. Margolin, B. Weiss, S.-T. Lu, and S. M. Michaelson (Rochester, University, Rochester, N.Y.). *Science,* vol. 206, Dec. 7, 1979, p. 1198-1201. 23 refs. Research supported by the U.S. Department of Energy.

Rats, with their fur clipped, pressed a lever to turn on an infrared lamp while in a cold chamber. When they were exposed to continuous-wave microwaves at 2450 MHz for 15-minute periods, the rate at which they turned on the infrared lamp decreased as a function of the microwave power density, which range between 5 and 20 mW/sq cm. This result indicates that behaviorally significant levels of heating may occur at an exposure duration and intensities that do not produce measurable changes in many other behavioral measures or in colonic temperature. Further study of how microwaves affect thermoregulatory behavior may help us understand such phenomena as the reported 'nonthermal' behavioral effects of microwaves. (Author)

A80-13591 Eye movements in paralyzed cats induced by drugs and sympathetic stimulation. R. A. Linsenmeier and B. G. Hertz (Northwestern University, Evanston, Ill.). *Vision Research,* vol. 19, no. 11, 1979, p. 1249-1252. 9 refs. Grants No. NIH-5-R01-EY-00206; No. NIH-5-F328-EY-05015; No. NIH-5-F32-EY-05193.

Cat eye movements were measured in animals anesthetized with urethane and paralyzed with high doses of gallamine. The eyes were relatively stable under these conditions, but when bicuculline, strychnine or methoxamine (Vasoxyl) was then given intraveneously, or when the animals were made hypoxic by respiring them with 5% O2, displacements in eye position of 0.5-2.75 deg were observed. A cervical sympathectomy reduced the eye movements caused by bicuculline and strychnine, but did not prevent the movements caused by any of the agents tested. Electrical stimulation of the cervical sympathetic nerve caused eye movements whose maximum amplitude was similar to those caused by drugs. (Author)

A80-13859 Calculation of the surface on which the corneal flash is located with application to the development of a system for recording eye movement. V. I. Kushpil' and V. P. Smirnov. *(Optiko-Mekhanicheskaia Promyshlennost',* vol. 46, Mar. 1979, p. 39-41.) *Soviet Journal of Optical Technology,* vol. 46, Mar. 1979, p. 160-162. 6 refs. Translation.

An expression is given for calculating the surface on which the corneal flash is located for arbitrary placement of the light source. A scheme for restricting the light beams when reproducing the corneal flash through an optical system and an expression for calculating the location and size of the entrance pupil of this system are discussed. (Author)

A80-13864 Humans deprived of normal binocular vision have binocular interactions tuned to size and orientation. D. M. Levi, R. S. Harwerth, and E. L. Smith, III (Houston, University, Houston, Tex.). *Science,* vol. 206, Nov. 16, 1979, p. 852-854. 20 refs. Grants No. NIH-R01-EY-01728; No. NIH-R01-EY-01139; No. NIH-K07-EY-000052.

The nature and extent of binocular interactions in humans deprived of normal visual experience by strabismus, amblyopia or both is investigated. Subjects viewed two matched cathode-ray-tube displays in a mirror stereoscope, and were asked to discriminate a test grating presented to one eye from a blank field or grating background presented to the other eye. It is found that a background

grating at a spatial frequency greater than the threshold decreased the contrast sensitivity of the other eye to test gratings similar in frequency for observers with normal binocular vision and with abnormal binocular vision, although the viewers with abnormal binocular vision failed to exhibit binocular summation at frequencies at or below the threshold. It is suggested that the normal excitatory connections between the two eyes are disrupted by the lack of binocular visual experience, while inhibitory interactions are not affected. A.L.W.

A80-13999 The importance of pattern information for the resolution of depth-ambiguous apparent motion. D. G. White, P. Wenderoth, and I. S. Curthoys (Sydney University, Sydney, Australia). *Perception and Psychophysics,* vol. 26, no. 5, Nov. 1979, p. 355-362. 15 refs. Australian Research Grants Committee Grant No. A74/15177.

A single apparent motion display can result in the perception of a rigid three-dimensional motion or a plastic, two-dimensional motion. Previous studies have found that the principal determinant of the perceptual outcome is the temporal properties of the apparent motion stimulus. Here it is shown that the form properties of the stimulus are another determinant and that, in some situations, they may become a more powerful determinant than the temporal properties. (Author)

A80-14000 * Choice reaction time to movement of eccentric visual targets during concurrent rotary acceleration. J. A. Hamerman (San Jose State University, San Jose, Calif.). *Perception and Psychophysics,* vol. 26, no. 5, Nov. 1979, p. 369-373. 18 refs. Grant No. NGL-05-046-002.

This study investigates the influence of concurrent rotary acceleration on choice reaction time (RT) to a small, accelerating visual cursor on a cathode-ray tube. Subjects sat in an enclosed rotating device at the center of rotation and observed a 3-mm dot accelerating at different rates across a cathode-ray tube. The dot was viewed at various eccentricities under conditions of visual stimulation alone and with concurrent rotary acceleration. Subjects responded to both vertical and horizontal dot movements. There was a significant inverse relationship between choice RT and level of dot acceleration (p less than .001), and a significant direct relationship between choice RT and eccentricity (p less than .001). There was no significant difference between choice RT to vertical or horizontal dot motion (p greater than .25), and choice RT was not significantly affected by concurrent rotary acceleration (p greater than .10). The results are discussed in terms of the effects of vestibular stimulation on choice RT to visual motion. (Author)

A80-14097 # Radiation and DNA (Radiatsiia i DNK). N. I. Riabchenko. Moscow, Atomizdat, 1979. 192 p. 615 refs. In Russian.

Consideration is given to the effects of ionizing radiation on the structure of DNA. Physical and chemical methods of determining radiation damage to the primary (polynucleotide chain and nitrogenous base) and secondary (helical) structure of DNA are discussed, and the effects of ionizing radiation on deoxyribonucleoprotein complexes are considered. The radiolysis of DNA in vitro and in bacterial and mammalian cells is examined and cellular mechanisms for the repair of radiation-damaged DNA are considered, taking into account single-strand and double-strand breaks, gamma-radiation damage and deoxyribonucleoprotein-membrane complex damage. Postradiation DNA degradation in bacteria and lymphatic cells is also discussed. A.L.W.

A80-14098 # Memory and adaptation (Pamiat' i adaptatsiia). R. Iu. Il'iuchenok. Novosibirsk, Izdatel'stvo Nauka, 1979. 192 p. 357 refs. In Russian.

The monograph analyzes physiological mechanisms on adaptation as functions of the efficiency of the activity of central regulatory systems and memory. Analysis of data on human adaptation to various climatic-geographic conditions revealed three adaptive stages based on different physiological mechanisms. Particular attention is given to memory processes and the functional asymmetry of the brain during the various adaptive stages. S.D.

A80-14099 # Visual information and vision of robots (Vizual'naia informatsiia i zrenie robotov). G. P. Katys. Moscow, Izdatel'stvo Energiia, 1979. 176 p. 111 refs. In Russian.

The book discusses information systems of robots, visual information processing in the visual organs of animals and robots, as well as systems of spatial filtration, functional transformation and pattern recognition. The discussion demonstrates the capabilities of visual information processing systems in enhancing the independence of robots and extending their potential and field of applications. S.D.

A80-14165 # Prediction of the physical work capacity of persons at mountain altitudes (Prognozirovanie fizicheskoi rabotosposobnosti liudei v vysokogor'e). A. L. Maksimov. *Voenno-Meditsinskii Zhurnal,* Sept. 1979, p. 47, 48. In Russian.

A80-14166 # Characteristics of oculomotor responses and their sensory components during simulation of low-altitude flights (Kharakteristika glasodvigatel'nykh reaktsii i ikh sensornykh komponentov pri modelirovanii poletov na malykh vysotakh). V. I. Babiiak. *Voenno-Meditsinskii Zhurnal,* Sept. 1979, p. 49-52. In Russian.

Simulated laboratory experiments were conducted on 25 healthy (normal vision) male subjects (18-22 yr) in order to study oculomotor responses and their sensory components as related to low-altitude flights. The objectives were (1) to study the dynamics of the angular velocity of the optokinetic nystagmus (OKN) slow component as a function of changes in the angular velocity of the optokinetic stimuli (OKSs); (2) to identify the OKN characteristics; and (3) to determine the quality of OKSs perception as a function of their angular displacement and OKN characteristics. It is found that the quality of perceiving OKSs is determined by the indices of the OKN slow component, which may be utilized for special professional selection of potential candidates. S.D.

A80-14257 # Interhemispheric relationships of monoamine oxidase activity and norepinephrine content in the cortical centers of the skin and motor analyzers in the human brain (O mezhpolusharnykh sootnosheniiakh monoaminoksidaznoi aktivnosti i soderzhaniia noradrenalina v korkovykh tsentrakh kozhnogo i dvigatel'nogo analizatorov mozga cheloveka). V. S. Kononenko (L'vovskii Meditsinskii Institut, Lvov, Ukrainian SSR). *Fiziologicheskii Zhurnal* (Kiev), vol. 25, Sept.-Oct. 1979, p. 529-535. 21 refs. In Russian.

A80-14258 # Effect of human exposure to a nitrogen-oxygen environment at 5-12 kgf/sq cm on certain indices of the higher nervous activity (Vliianie prebyvaniia cheloveka v azotno-kislorodnoi srede pod davleniem 5-12 kgs/sq cm na nakotorye pokazateli vysshei nervnoi deiatel'nosti). S. A. Guliar, E. V. Moiseenko, S. S. Sirota, V. A. Grinevich, and V. K. Skudin (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologicheskii Zhurnal* (Kiev), vol. 25, Sept.-Oct. 1979, p. 576-584. 28 refs. In Russian.

A80-14259 # Current problems of hypothermy (Sovremennye problemy gipotermii). K. V. Ostashkov (Odesskii Gosudarstvennyi Universitet, Odessa, Ukrainian SSR). *Fiziologicheskii Zhurnal* (Kiev), vol. 25, Sept.-Oct. 1979, p. 585-592. 78 refs. In Russian.

A historical review is presented of the various effects of hypothermy on warm-blooded animals and man. In the course of body cooling, each organ traverses an intrinsic state of 'biological null' where functional activity comes to an end. Attention is given to hypothermic (hibernation-induced) surgeries involving the anabiotic stage. Application of cold in biology and medicine aims at reducing metabolism and oxygen demand in all tissues, including the cerebral tissue. The use of hypothermic pharmacodynamic drugs in anesthesiology is also discussed. The problem of the most favorable reduced body temperature still remains unsolved. S.D.

A80-14260 # **Catecholamines and chemical thermoregulation during cold acclimation (Katekholaminy i khimicheskaia termoreguliatsiia pri akklimatsii k kholodu).** V. I. Sobolev (Donetskii Gosudarstvennyi Universitet, Donetsk, Ukrainian SSR). *Fiziologicheskii Zhurnal* (Kiev), vol. 25, Sept.-Oct. 1979, p. 593-603. 125 refs. In Russian.

Evidence is presented, indicating that catecholamines take part in the reactions of the body to the impact of cold of varying intensity and duration. It is shown that the thermogenic effect of norepinephrine after cold acclimation is mainly associated with the contracile activity of muscles. According to a specified mechanism for the action of catecholamines on chemical thermoregulation, cold stimulates the yield of endogenic catecholamines and thyroid hormones. Reduction of oxidation efficiency is due both to the dissociative action of fatty acids and to the effect of thyroid hormones on this system. As a result of all these processes, additional heat is released, which indeed gives rise to the calorigenic effect of catecholamines. S.D.

A80-14382 # **Separation of motions in the problem of stabilizing biped walking (O razdelenii dvizhenii v zadache stabilizatsii dvunogoi khod'by).** Iu. V. Bolotin. *Akademiia Nauk SSSR, Izvestiia, Mekhanika Tverdogo Tela,* July-Aug. 1979, p. 48-53. In Russian.

A80-14793 **Medical applications of aerospace technology.** D. C. Harrison, E. V. Schmidt, and L. F. Brennan (Stanford University, Stanford, Calif.). In: Space - The best is yet to come; Proceedings of the Sixteenth Space Congress, Cocoa Beach, Fla., April 25-27, 1979. Cocoa Beach, Fla., Canaveral Council of Technical Societies, 1979, p. 6-15 to 6-24. 11 refs.

The paper reviews methods by which biomedical application teams diffuse new technology from aerospace related research to medical applications. These teams are sponsored by NASA for applying aerospace technology to the solution of significant problems in biomedical research and clinical medicine and include laboratory and clinical applications. The technology transfer process is illustrated with specific examples which include biomedical electrodes, biotelemetry for pediatric gait analysis, and intracranial pressure monitoring, noting the need for a multidisciplinary approach. Innovative technology currently developed such as portable speech prosthesis, liquid circulating garments, and noninvasive determination of bone properties are described, and impediments to biomedical technology transfer are noted. A.T.

A80-14797 **Interdependence between the saccadic and the continuous eye movement control systems.** D. Bouis (Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung, Karlsruhe, West Germany) and G. Vossius (Karlsruhe, Universität, Karlsruhe, West Germany). In: A link between science and applications of automatic control; Proceedings of the Seventh Triennial World Congress, Helsinki, Finland, June 12-16, 1978. Volume 1. Oxford and New York, Pergamon Press, 1979, p. 489-493. 8 refs.

The eye movements are considered to be under double control: one is continuous and regulates the speed of the tracking movement of the eye, the other is discontinuous and regulates the position of the eye by eye jumps named saccades. This paper covers the control problems of the total system which stems from the collaboration of the two branches. The controller takes the size of the error in position and in speed into account. It executes the error correction in a nearly optimal way through saccades or by varying the tracking speed. The experimental evidence and a mathematical model of the functional structure of the system including the optimization strategy are presented. (Author)

A80-14798 **Parameter estimation of radiocardiogram using a minicomputer.** K. Minato, M. Kuwahara (Kyoto University, Uji, Japan), Y. Yonekura, and A. Hirakawa (Kyoto University Hospital, Kyoto, Japan). In: A link between science and applications of automatic control; Proceedings of the Seventh Triennial World Congress, Helsinki, Finland, June 12-16, 1978. Volume 1. Oxford and New York, Pergamon Press, 1979, p. 533-540. 8 refs.

Radiocardiography has been widely used as a method for the quantification of cardiac output by applying the principle of the dye dilution method. In this paper, an efficient least square parameter estimation procedure in a frequency domain for a linear system with time delays, which is the model of transport process appearing in the radiocardiogram, is shown. The procedure is based on properties of Fourier transformation and a concept of a feature space, and parameter sensitivity analysis is applied to study behavior of parameters on the model. Some analyzed results of radiocardiograms are shown and it is verified that the procedure is sufficiently useful and efficient for routine clinical use. (Author)

A80-14801 **Integrated walking robot simulation and modelling.** D. E. Okhotsimskii, A. K. Platonov (Akademiia Nauk SSSR, Institut Prikladnoi Matematiki, Moscow, USSR), G. V. Gerkhen-Gubanov, V. G. Kuznetsov (Leningradskii Mekhanicheskii Institut, Leningrad, USSR), E. A. Devianin, A. V. Lenskii (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR), V. S. Gurfinkel, and A. Iu. Shneider (Akademiia Nauk SSSR, Institut Problem Peredachi Informatsii, Moscow, USSR). In: A link between science and applications of automatic control; Proceedings of the Seventh Triennial World Congress, Helsinki, Finland, June 12-16, 1978. Volume 2. Oxford and New York, Pergamon Press, 1979, p. 917-924. 20 refs.

The paper discusses some problems of development software and hardware for controlling the motion of an integrated walking robot. A six-legged vehicle supplied with a scanning distance-measuring system was taken as a reasonable configuration. Some results of computer simulation as well as results of the investigations carried out with computer-controlled laboratory models, are presented. (Author)

A80-15225 * **Problems and potentialities of cultured plant cells in retrospect and prospect.** F. C. Steward and A. D. Krikorian (New York, State University, Stony Brook, N.Y.). In: Plant cell and tissue culture: Principles and applications. Columbus, Ohio State University Press, 1979, p. 221-262. 125 refs. Grants No. NIH-GM-09609; No. NsG-7270; Contract No. NAS2-7846.

The past, present and expected future accomplishments and limitations of plant cell and tissue culture are reviewed. Consideration is given to the pioneering insights of Haberlandt in 1902, the development of culture techniques, and past work on cell division, cell and tissue growth and development, somatic embryogenesis, and metabolism and respiration. Current activity in culture media and technique development for plant regions, organs, tissues, cells, protoplasts, organelles and embryos, totipotency, somatic embryogenesis and clonal propagation under normal and space conditions, biochemical potentialities, and genetic engineering is surveyed. Prospects for the investigation of the induced control of somatic cell division, the division of isolated protoplasts, the improvement of haploid cell cultures, liquid cultures for somatic embryogenesis, and the genetic control of development are outlined. A.L.W.

A80-15231 # **The use of a positive displacement air cycle machine in a closed-loop environmental control system.** L. L. Midolo (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, 9th, San Francisco, Calif., July 16-19, 1979, Paper 79-ENAs-6.* 9 p. Members, $1.50; nonmembers, $3.00.

The paper describes a closed-loop environmental control system (ECS) concept which uses a positive displacement air cycle machine (PD-ACM) as a component in the system. Aircraft closed-loop ECS take-off-gross-weight penalty savings and life cycle cost benefits are developed and compared with conventional open-loop ECS. The PD-ACM performance is described and shown to be a competitive air cycle machine for use with the potentially low life cycle cost closed-loop ECS concept. (Author)

A80-15238 # **A study of the reduction of carbon dioxide in a silent electric discharge.** R. S. Luce (Lockheed Missiles and Space Co., Inc., Sunnyvale, Calif.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, 9th, San Francisco, Calif., July 16-19, 1979, Paper 79-ENAs-13.* 8 p. Members, $1.50; nonmembers, $3.00.

An investigation of the reduction of CO2 to O2 and CO in a silent electric discharge was undertaken with the intent of correctly understanding the process and operating it at optimum efficiency. The study led to an accurate description of the role of current in CO2 reduction in the induced ionized plasma. Voltage and frequency were important only as inducers of current in the plasma. Pressure and temperature are minimally influential in the process. Flow rate is important only in that gas residence time in the plasma is proportionally related to CO2 reduction. The large power consumption in the process was recognized as resulting from the low power factor of the reactor vessel which behaves as a dynamic electrical capacitor. The power factor was subsequently improved by an inductive element to make the reactor vessel capacitance part of a resonant circuit. It was found that the CO2 reduction process was most efficient in terms of power versus reduction rate when a voltage was employed that was only slightly higher than that needed to induce the plasma. The study concluded with a demonstration that with this apparatus one liter of CO2 could be reduced with an expenditure of less than 360 kilojoules (100 watt-hours) of energy. Had absolute efficiency been possible, 11.95 kilojoules (3.29 watt-hours) would have been required for the same result. (Author)

A80-15240 * # **High-pressure protective systems technology.** H. C. Vykuka' and B. W. Webbon (NASA, Ames Research Center, Moffett Field, Calif.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, 9th, San Francisco, Calif., July 16-19, 1979, Paper 79-ENAs-15.* 16 p. 14 refs. Members, $1.50; nonmembers, $3.00.

Space suit assemblies developed in the past provide candidate concepts to meet future extravehicular-activity requirements. The paper is concerned with the development of the modular 8-psi Ames AX-3 high-pressure suit assembly on the basis of a review of existing suit assemblies, component developments, and mobility exercises. The discussion covers description of the AX-3 suit, its performance, and technology developments. In conclusion, high-pressure space suit technology is demonstrated with the development of the Ames AX-3 suit assembly. Several photographs and diagrams supplement the text. S.D.

A80-15241 * # **Design and development of a trace contaminant removal canister for Spacelab.** C. D. Ray, J. W. Littles, J. L. Blair (NASA, Marshall Space Flight Center, Huntsville, Ala.), and R. B. Jagow (Lockheed Missiles and Space Co., Inc., Sunnyvale, Calif.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, 9th, San Francisco, Calif., July 16-19, 1979, Paper 79-ENAs-16.* 11 p. 15 refs. Members, $1.50; nonmembers, $3.00. NASA-supported research.

The paper describes the overall approach used by NASA-MSFC to design and develop a trace contaminant removal canister for Spacelab. The elements of this approach include the establishment of a trace contaminant load model, analysis and testing to define a preliminary design, development testing to verify the adequacy of the selected design, and testing to define a suitable canister location in the transfer tunnel ventilation system. The canister utilizes a catalyst material which is effective in removing carbon monoxide at room temperature, as well as plain and acid treated charcoal. The canister alone will control all contaminants in the load model below their maximum allowable concentration (MAC) levels without assistance from the baseline environmental control system (ECS) except for methyl alcohol and ammonia. V.T.

A80-15243 # **Development of a Space Shuttle plant growth unit.** R. B. Maine, P. A. Wagner, T. M. Olcott, and R. S. Luce (Lockheed Missiles and Space Co., Inc., Sunnyvale, Calif.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, 9th, San Francisco, Calif., July 16-19, 1979, Paper 79-ENAs-19.* 11 p. 7 refs. Members, $1.50; nonmembers, $3.00.

The Space Shuttle Plant Growth Experiment studies the effects of space flight on plant lignification. The hardware required to support scientific investigations designed to examine whether the polymer lignin will aid plants in growing upright against the force of gravity is examined. Experiments are conducted using a self-contained package which holds six plant growth chambers each containing 16 plant seedlings for a total of 96 plants. Attention is given to the subsystems that provide lighting, thermal control, instrumentation/data management, power and control/display functions meeting both environmental and data acquisition requirements. C.F.W.

A80-15251 * # **Closed-ecology life support systems /CELSS/ for long-duration, manned missions.** M. Modell (MIT, Cambridge, Mass.) and J. M. Spurlock (Georgia Institute of Technology, Atlanta, Ga.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, 9th, San Francisco, Calif., July 16-19, 1979, Paper 79-ENAs-27.* 7 p. 10 refs. Members, $1.50; nonmembers, $3.00. NASA-sponsored research.

Studies were conducted to scope the principal areas of technology that can contribute to the development of closed-ecology life support systems (CELSS). Such systems may be required for future space activities, such as space stations, manufacturing facilities, or colonies. A major feature of CELSS is the regeneration of food from carbon in waste materials. Several processes, using biological and/or physico-chemical components, have been postulated for closing the recycle loop. At the present time, limits of available technical information preclude the specification of an optimum scheme. Nevertheless, the most significant technical requirements can be determined by way of an iterative procedure of formulating, evaluating and comparing various closed-system scenario. The functions features and applications of this systems engineering procedure are discussed. (Author)

A80-15252 # **Use of phytotrons in assessing environmental requirements for plants in space habitats.** C. D. Raper, Jr., J. F. Thomas (North Carolina State University, Raleigh, N.C.), and T. A. Pollock (East Carolina University, Greenville, N.C.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, 9th, San Francisco, Calif., July 16-19, 1979, Paper 79-ENAs-28.* 6 p. 12 refs. Members, $1.50; nonmembers, $3.00.

Phytotrons are laboratories designed for study of plant responses to artificial light, temperature, humidity, nutrition, and carbon dioxide composition of the atmosphere. Thus, phytotrons provide an existing capability for determining the environmental requirements for higher plant culture in a space habitat. Coupled with mathematical modeling, data from phytotron experimentation can become the basis for projections of amounts of material that are tied up in the agricultural system at any time as well as the rate of removal of carbon dioxide and evolution of oxygen. Such information is critical for feasibility studies of the life support system. Other examples of critical information that can be gained in phytotron experimentation will be discussed. (Author)

A80-15253 * # **Recycling plant, human and animal wastes to plant nutrients in a closed ecological system.** H. P. Meissner and M. Modell (MIT, Cambridge, Mass.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, 9th, San Francisco, Calif., July 16-19, 1979, Paper 79-ENAs-29.* 6 p. Members, $1.50; nonmembers, $3.00. NASA-supported research.

The essential minerals for plant growth are nitrogen, phosphorous, potassium (macronutrients), calcium, magnesium, sulfur (secondary nutrients), iron, manganese, boron, copper, zinc, chlo-

rine, sodium, and molybdenum (micronutrients). The first step in recycling wastes will undoubtedly be oxidation of carbon and hydrogen to CO2 and H2O. Transformation of minerals to plant nutrients depends upon the mode of oxidation to define the state of the nutrients. For the purpose of illustrating the type of processing required, ash and off-gas compositions of an incineration process were assumed and subsequent processing requirements were identified. Several processing schemes are described for separating out sodium chloride from the ash, leading to reformulation of a nutrient solution which should be acceptable to plants. (Author)

A80-15254 # **Controlled-environment agricultural systems as food sources for large space habitats.** J. M. Phillips (Arizona Research Associates, Inc., Tucson, Ariz.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, 9th, San Francisco, Calif., July 16-19, 1979, Paper 79-ENAs-30.* 7 p. 22 refs. Members, $1.50; nonmembers. $3.00.

Controlled-environment agriculture (CEA), presently used in countries that are congested (Japan, Europe) or have severe weather problems (Soviet Union, Abu Dhabi), may be applied in the near future towards developing large space habitats into closed life support systems. CEA systems have provided such benefits as increased crop yield, accelerated growth rates, efficient resource utilization and predictability of production, but their drawback is expense in terms of capital, energy, labor, and materials. Applying CEA technology in space (using recycled wastes) could generate beneficial spin-offs for earth, including development of more efficient greenhouses and recycling programs, productivity research in agriculture, and increased knowledge regarding the quantitative requirements to sustain human life. J.P.B.

A80-15255 * # **Food technology in space habitats.** M. Karel (MIT, Cambridge, Mass.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, 9th, San Francisco, Calif., July 16-19, 1979, Paper 79-ENAs-31.* 6 p. 10 refs. Members, $1.50; nonmembers, $3.00. NASA-supported research.

The research required to develop a system that will provide for acceptable, nutritious, and safe diets for man during extended space missions is discussed. The development of a food technology system for space habitats capable of converting raw materials produced in the space habitats into acceptable food is examined. C.F.W.

A80-15256 * # **Bosch - An alternate CO2 reduction technology.** D. B. Heppner, T. M. Hallick (Life Systems, Inc., Cleveland, Ohio), D. C. Clark (NASA, Marshall Space Flight Center, Huntsville, Ala.), and P. D. Quattrone (NASA, Ames Research Center, Moffett Field, Calif.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, 9th, San Francisco, Calif., July 16-19, 1979, Paper 79-ENAs-32.* 9 p. 11 refs. Members, $1.50; nonmembers, $3.00. Contracts No. NAS8-30891; No. NAS8-32492; No. NAS2-8666.

The Bosch process is the most promising CO2 reduction concept for future prolonged space missions. The paper presents the design of a three-person-capacity preprototype B-CRS (Bosch-based CO2 Reduction Subsystem). It is sized to reduce 3.0 kg/d CO2 generated by the crew and to supply the product water to an O2 generation subsystem to obtain O2. The design supports future development of the B-CRS as an alternative CO2 reduction subsystem to the Sabatier-based process presently under test at NASA. The discussion covers the Bosch CO2 reduction concept, process and hardware description, performance parameters, design specifications, subsystem schematic and operation, mechanical subsystem summary, control/monitor instrumentation, and subsystem packaging. A B-CRS with a proven technological base is an attractive CO2 reduction subsystem that eliminates overboard venting. S.D.

A80-15257 * # **Development of the electrochemically regenerable carbon dioxide absorber for portable life support system application.** R. R. Woods, D. B. Heppner, R. D. Marshall (Life Systems, Inc., Cleveland, Ohio), and P. D. Quattrone (NASA, Ames Research Center, Moffett Field, Calif.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, 9th, San Francisco, Calif., July 16-19, 1979, Paper 79-ENAs-33.* 9 p. 12 refs. Members, $1.50; nonmembers, $3.00. Contract No. NAS2-8666.

As the length of manned space missions increase, more ambitious extravehicular activities (EVAs) are required. For the projected longer mission the use of expendables in the portable life support system (PLSS) will become prohibited due to high launch weight and volume requirements. Therefore, the development of a regenerable CO2 absorber for the PLSS application is highly desirable. The paper discusses the concept, regeneration mechanism, performance, system design, and absorption/regeneration cycle tessting of a most promising concept known as ERCA (Electrochemically Regenerable CO2 Absorber). This concept is based on absorbing CO2 into an alkaline absorbent similar to LiOH. The absorbent is an aqueous solution supported in a porous matrix which can be electrochemically regenerated on board the primary space vehicle. With the metabolic CO2 recovery the ERCA concept results in a totally regenerable CO2 scrubber. The ERCA test hardware has passed 200 absorption/regeneration cycles without performance degradation. S.D.

A80-15258 # **EDC - A regenerable CO2 removal subsystem for an enhanced capability orbiter.** R. D. Marshall, F. H. Schubert, and P. Y. Yang (Life Systems, Inc., Cleveland, Ohio). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, 9th, San Francisco, Calif., July 16-19, 1979, Paper 79-ENAs-34.* 12 p. 17 refs. Members, $1.50; nonmembers, $3.00.

The Electrochemical Depolarized Carbon Dioxide (CO2) Concentrator (EDC) is being developed as an advanced CO2 removal concept to replace the baseline lithium hydroxide (LiOH) system. The EDC offers significant weight savings through reduced expendables for projected enhanced capability Orbiter missions. The EDC can be integrated with existing Shuttle resources or, as mission profiles require, combined with Water Vapor Electrolysis (WVE) for oxygen (O2) regeneration to further reduce mission expendables. The EDC and EDC/WVE subsystems were evaluated for: (1) the baseline Shuttle when expanded to accommodate a crew of seven, (2) an Extended Duration Orbiter (EDO) with a Power Extension Package (PEP) to reduce fuel cell expendables and (3) an EDO with a full capability power module to eliminate fuel cell expendables. Weight savings attainable using EDC CO2 Removal Subsystem are 59 kg (130 lb), 218 kg (480 lb), and 363 kg (800 lb), respectively, for the mission options evaluated. (Author)

A80-15260 # **Development of an improved Sabatier reactor.** P. J. Birbara and F. Sribnik (United Technologies Corp., Hamilton Standard Div., Windsor Locks, Conn.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, 9th, San Francisco, Calif., July 16-19, 1979, Paper 79-ENAs-36.* 10 p. 7 refs. Members, $1.50; nonmembers, $3.00.

This paper presents the results of recent experimental and analytical studies of a Sabatier reactor where carbon dioxide and hydrogen in the presence of a catalyst react to form water, methane, and heat. The work undertaken in this program was aimed at simplification of design and control concepts of Sabatier subsystems. To this end, effort was expended to the development of UASC-151G, a highly active, physically durable catalyst composed of ruthenium on alumina. UASC-151G is five times as active as that supplied for the SSP program. The use of this improved catalyst has very significant effects on the Sabatier reaction subsystem design including: (1) lower temperature starting capability, (2) simiplification of active control and instrumentation requirements, (3) simplified reactor design, (4) improved reliability, and (5) high conversion efficiencies using only small amounts of catalyst. Reasonable agreement between test and computer simulation has been obtained for temperature and lean component conversion efficiencies for both steady-state and cyclic operation. (Author)

A80-15266 # **/Hard Hat/ EVA, personal equipment to support large scale construction in space.** R. C. Wilde (United Technologies Corp., Hamilton Standard Div., Windsor Locks, Conn.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, 9th, San Francisco, Calif., July 16-19, 1979, Paper 79-ENAs-43.* 9 p. Members, $1.50; nonmembers, $3.00.

During the next 20 years, extravehicular activity (EVA) to assemble large-scale space structures in orbit will require equipment with high cycle life, high mobility joints and improved hygiene for use up to 8 hours during both orbital light and dark periods, at pressures up to 0.54 Atm (to eliminate the purge oxygen pre-breathe). The pressure enclosure will feature no don-doff assistance, wrist-mounted displays and controls, the movable scye bearing (to allow overhead arm movement), and modular construction for comfort. The materials evaluated for up to 29 kg of radiation shielding are metallic glass, multidrawn Chromel-R metal fabric and flexible laminated sheet material. The transmissibility of wide angle helmet visors will be automatically controlled by miniature photo sensors, while there is a novel concept of thermal insulation for the gloves. The potassium carbonate liquid sorbent process (regenerable) may replace lithium hydroxide (non-regenerable) as a carbon dioxide remover in the life support system, and thermal control will be effected by a hybrid concept: a sublimator/phase change material, radiator approach. J.P.B.

A80-15268 # **Environmental systems for aquatic animal studies in the Shuttle era.** R. B. Hoffman (General Electric Co., Space Div., Houston, Tex.), S. R. Hunt, Jr. (General Electric Co., Space Div., Valley Forge, Pa.), G. Kring, and G. Wirths (Dornier System GmbH, Friedrichshafen, West Germany). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, 9th, San Francisco, Calif., July 16-19, 1979, Paper 79-ENAs-45.* 8 p. 9 refs. Members, $1.50; nonmembers, $3.00.

Open and closed life support systems for aquatic animals utilized in parabolic aircraft flight and spaceborne biomedical experiments are reviewed. The gas-permeable polyethylene bags used to house fish eggs on the Skylab and ASTP missions, the plexiglass fish cages used in parabolic flight experiments and the Biosatellite frog egg modules are described as instances of short duration open systems. Long duration closed systems proposed as part of the Life Sciences Laboratory Equipment inventory for Spacelab are detailed, including a modified Dornier fish incubator for behavioral, developmental and vestibular investigations, and an integrated modular frog-holding facility containing a specimen container with provisions for stereotaxic positioning and a pump separator for gas exchange and fluid purification. The systems are shown to be capable of accommodating a large diversity of experiments under habitable conditions for long and short duration flights. A.L.W.

A80-15271 # **Applications of the thermoelectrically integrated membrane evaporator subsystem.** A. O. Brouillet and C. K. Boynton, Jr. (United Technologies Corp., Hamilton Standard Div., Windsor Locks, Conn.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, 9th, San Francisco, Calif., July 16-19, 1979, Paper 79-ENAs-48.* 7 p. Members, $1.50; nonmembers, $3.00.

Future extended duration space missions will benefit from conservation and recovery of vehicle and crew waste products to reduce resupply expenditures. Reclamation of potable water from urine, humidity condensate, and wash water is the single most significant candidate for recovery. The Thermoelectrically Integrated Membrane Evaporator Subsystem (TIMES) distillation water recovery concept utilizing hollow fiber membranes for phase separation and thermoelectric heat pumps for latent heat recovery brings unique advantages to meet the challenge of reliable, efficient, zero gravity water recovery. The TIMES concept limits precision moving parts to valves and pumps leaving small, lightweight static parts for the evaporation and condensation modules. The many varied applications of the TIMES, e.g., Extended Duration Orbiter, space 'Construction Shacks', free-flying space labs, and Space Station will benefit from the modularity of the concept. The paper discusses the optimization and application of the TIMES concept and the benefit of the concept's modularity to these aspects. Further vehicular and other subsystem integration flexibility of the TIMES concept are presented. (Author)

A80-15629 **The place of computerized axial tomography /CAT/ in the examination of flight crews (Place de la tomodensitométrie /TDM/ dans l'expertise du personnel navigant).** E. A. Cabanis, M. T. Iba-Zizen, L. Guillaumat, E. Queiroz, K. I. S. Teixeira, G. Porret (Centre National d'Ophtalmologie des 15/20, Paris, France), R. P. Delahaye, and P. Metges (Hôpital d'Instruction des Armées Begin, Saint-Mandé, Val-de-Marne, France). *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare,* vol. 18, 2nd Quarter, 1979, p. 114-123. In French.

The principles and techniques of cephalic computerized axial tomography (CAT) are reviewed, and results of the application of the technique are presented, with a consideration of its use for the diagnosis of pathological conditions in flight crews. The computerized registration of X-ray fluxes and generation of the X-ray image are discussed, and the practical conditions of examination are outlined. Results of the CAT scan of a presumably normal cephalic cavity are illustrated, together with images obtained from persons suffering tumoral, vascular, traumatic, infectious, degenerative and malformation syndromes. Indications, contraindications, and clinical situations for the application of the technique to flight personnel are discussed, and an increase in CAT indications for flight crews is predicted. A.L.W.

A80-15633 **The physiopathology of vertebral pain in helicopter pilots (Physiopathologie des algies vertébrales des pilotes d'hélicoptères).** R. P. Delahaye, R. Auffret, P. J. Metges, J. L. Poirier, and J. Vicens (Hôpital d'Instruction des Armées Begin, Saint Mandé, Val-de-Marne; Centre d'Essais en Vol, Brétigny-sur-Orge, Essonne; Armée de l'Air, Ecole d'Application, Paris, France). *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare,* vol. 18, 2nd Quarter, 1979, p. 142-145. In French.

The effects of posture and vibration on spinal pathology in helicopter pilots are discussed, and preventative measures are presented. Consideration is given to the physical requirements of the task of piloting a helicopter, the relations between pilot postures determined by the seats of various helicopters and optimal comfort angles, and the origin of vertebral pain. The physiological effects of resonant vibrations in the z-axis on a spine already sensitized by poor posture are discussed, noting the apparition of clinically observed degenerative discopathy. Attempts to adapt aircraft to human requirements, such as the replacement of articulated metal systems by single plastic constructions, the installation of vibration dampers and the use of automatic postural stabilizers in the present-generation Gazelle, Dauphin, Ecureuil and Super Frelon helicopters, are presented, and the selection and periodic examination of helicopter pilots are discussed. A.L.W.

A80-15634 **Investigation of certain electrophysiological and biochemical parameters in hypoxia testing at a simulated altitude of 5500 m (Investigation de certains paramètres électrophysiologiques et biochimiques dans l'épreuve d'hypoxie simulée à une altitude de 5500 m).** A. T. C. Popescu, I. Pintilie, I. Nastoiu, L. Constantinescu, and V. Cumpanasu (Centre Médical Aéronautique, Bucharest, Rumania). *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare,* vol. 18, 2nd Quarter, 1979, p. 146-149. In French.

Electrophysiological and biochemical changes in healthy subjects following exposure to 15 min at a simulated altitude of 5500 m in a pressure chamber are determined. Electrophysiological changes are found to be within the classical range of hypoxia effects, consisting of a progressive tachycardia parallel to the increase in altitude. Biochemical analyses reveal no significant changes in blood composition following hypoxia, however a marked increase in potassium levels and significant decreases in magnesium and phosphorous levels in the urine are observed. The lack of myocardial

electrical variations obtained is interpreted as a demonstration of the innocuousness of the test procedure, and changes in urine electrolyte concentrations are discussed in terms of the renin-angiothensin-aldosterone mechanism and the compensations of respiratory alkalosis. A.L.W.

A80-15635 The importance of continuous electrocardiogram recording in conduction disorders in flight crews (Intérêt de l'enregistrement continu de l'électro cardiogramme dans les troubles de la conduction chez le personnel navigant). A. Seigneuric, G. Leguay, and J. M. Denee (Hôpital d'Instruction des Armées Dominique Larrey, Versailles, France). *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare,* vol. 18, 2nd Quarter, 1979, p. 150-153. 5 refs. In French.

The importance of continuous electrocardiography in localizing and determining the nature of conduction disorders in flight crews is demonstrated, and a technique for continuous electrocardiogram recording is presented. The case history of a 31-year-old pilot with an intermittently appearing atrioventricular block is used to illustrate the utility of the Holter technique of continuous electrocardiography. The Holter technique is described as consisting of recording an electrocardiogram on magnetic tape continuously for periods of 12, 24 or even 72 hours and reading it semiautomatically at accelerated speeds. It is pointed out that continuous electrocardiography for 24 hours and during a normal flight allowed the diagnosis of a second degree Wenkebach atrioventricular block associated with a sinus rate slowing, which implied a vagal origin. A.L.W.

A80-15636 The application of indirect oxymetry in the criticism of the dilution standards of oxygen regulators (Apport de l'oxymétrie indirecte dans la critique des normes de dilution des régulateurs d'oxygène). H. Marotte and H. Vieillefond (Centre d'Essais en Vol, Brétigny-sur-Orge, Essonne, France). *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare,* vol. 18, 2nd Quarter, 1979, p. 154-156. In French.

A noninvasive means of measuring arterial oxygen saturation is applied to the evaluation of two emergency oxygen masks for airline personnel. The efficacies of two oxygen masks which did not meet FAA dilution standards at simulated altitudes between 10,000 and 20,000 ft in supplying sufficient amounts of oxygen to the blood were determined by means of an ear oxymeter which measures the absorption of eight wavelengths of light by arterial blood. Results indicate that neither of the masks allowed oxygen saturation to fall below 92 percent at simulated altitudes up to 25,000 ft, thus demonstrating the sufficiency of the masks in question, in contrast to the results of standard tests. A.L.W.

A80-15996 Unreliability of exercise-induced R wave changes as indexes of coronary artery disease. S. Wagner, K. Cohn, and A. Selzer (Presbyterian Hospital, San Francisco, Calif.). *American Journal of Cardiology,* vol. 44, Dec. 1979, p. 1241-1246. 38 refs.

The responses of 40 young normal subjects and 28 patients with chest pain and no significant coronary arterial obstruction were compared with those of 73 patients with coronary arterial narrowing of various degrees of severity, all having undergone submaximal, multiple-lead multistaged treadmill exercise testing. The objective was to assess the diagnostic value of exercise-related QRS amplitude changes. No significant relation was found between the extent of coronary artery disease (CAD) and R wave changes. An analysis of multiple variables suggested possible correlations with factors not directly related to ischemia. It is concluded that exercise-induced QRS amplitude changes are unreliable predictors of the presence, absence or severity of CAD. S.D.

A80-15997 Analysis of exercise-induced R wave amplitude changes in detection of coronary artery disease in asymptomatic men with left bundle branch block. G. S. Uhl, J. Andrew, and C. Hopkirk (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *American Journal of Cardiology,* vol. 44, Dec. 1979, p. 1247-1250. 18 refs.

Results are presented for a study designed to assess the usefulness of exercise-induced R wave amplitude changes in detecting coronary artery disease (CAD) in asymptomatic men with acquired left bundle branch block (LBBB). The treadmill exercise ECGs of 44 test subjects were analyzed and the results correlated with findings on selective coronary angiography. The results indicate that the increase in R wave amplitude with exercise appears to be a sensitive test in identifying CAD in asymptomatic persons with LBBB. S.D.

A80-15998 Echocardiographic recognition of atrioventricular valve stenosis associated with endocardial cushion defect - Pathologic and surgical correlates. K. R. Bloom, R. M. Freedom, C. M. Williams, G. A. Trusler, and R. D. Rowe (Hospital for Sick Children, Toronto, Canada). *American Journal of Cardiology,* vol. 44. Dec. 1979, p. 1326-1331. 22 refs.

The paper describes nine infants who had clinical and angiocardiographic features of an endocardial cushion defect but who also had significant stenosis of either the mitral or tricuspic valve. The surgical repair of endocardial cushion defect is now an accepted practice. However, operation may not be possible in an important pathologic subgroup of infants with this defect because of associated A-V valve stenosis and a smaller than normal or even a hypoplastic ventricle. M mode echocardiography enables one to define the small ventricle and abnormal portion of the common A-V valve. One must then obtain angiograms in specific views to determine ventricular size. Preoperative recognition of this combination of defects may thus lead one to suggest a more palliative surgical approach in combination with a vigorous medical regimen for treatment of heart failure. These measures might enable some of these infants to survive to an age when ventricular growth could make a more definitive surgical approach possible. S.D.

A80-16068 Uracil in carbonaceous meteorites. P. G. Stoks and A. W. Schwartz (Nijmegen, Katholieke Universiteit, Nijmegen, Netherlands). *Nature,* vol. 282, Dec. 13, 1979, p. 709, 710. 18 refs.

The paper reports positive identification of uracil in water and formic acid extracts of Murchison, Murray, and Orgueil carbonaceous meteorites. This investigation was made because of the reported synthesis of uracil, thymine, and cytosine in Fischer-Tropsch-type reactions which may be significant in the production of organic material in meteorites and of interest to theories of chemical evolution and the origin of life. Control experiments showed that uracil and thymine were selectively eluted from meteorite sample extracts and analyzed by cation and anion exclusion chromatography. Peaks in the uracil position on the cation exclusion chromatograms were refractionated and analyzed by mass spectrometry which confirmed the identity of uracil. A.T.

A80-16393 A closed system: Man-higher plants /four-month experiment/ (Zamknutaia sistema: Chelovek-vysshie rasteniia /chetyrekhmesiachnyi eksperiment/). Edited by G. M. Lisovskii. Novosibirsk, Izdatel'stvo Nauka, 1979. 160 p. In Russian.

The monograph reports the results of a unique four-month experimental study in a hermetically closed system where the environment of human habitat was continuously regenerated by higher plants. These plants have fully provided the human subjects with oxygen, water, and the basic part of vegetable food. The experimental procedure used and the structure of the system are described. Also provided are data obtained from phytophysiological, medicobiological, biochemical and microbiological investigations of the man-higher plants system. S.D.

A80-16430 # The Life Sciences Flight Experiments Program - An update. J. C. Stonesifer. *American Astronautical Society, Annual Meeting, Los Angeles, Calif., Oct. 29-Nov. 1, 1979, Paper 79-250.* 9 p.

The Shuttle era will provide the first opportunity to carry out a thorough experimental program in the life sciences in space under conditions approximating those of ground-based laboratories. The

Life Sciences Flight Experiments Program is organized to take full advantage of this opportunity, and to provide the basic programmatic capabilities for the conduct of associated scientific investigations. The paper provides an update on this program as one moves from the early planning phases and the development of the programmatic capabilities into the implementation activities of the program. The discussion covers the experiment selection process; the experiment definition phase; the Life Sciences Laboratory Equipment; the life sciences support facilities; program data system design and implementation; and development, engineering and operations contract. S.D.

A80-16431 * # Experiments for dedicated life science missions. R. M. Farrell, J. A. Rummel (NASA, Life Sciences Div., Washington, D.C.), and T. L. Schilling (General Electric Co., Arlington, Va.). *American Astronautical Society, Annual Meeting, Los Angeles, Calif., Oct. 29-Nov. 1, 1979, Paper 79-251.* 22 p.

Over 80 investigations were selected recently as candidate experiments for Life Science Spacelab Missions in the 1983-1985 time frame. A payload consisting of perhaps 20 of these experiments will be selected in 1981, approximately two years before the first dedicated Life Sciences Spacelab Mission. Implementation of a carefully designed management process will be a prerequisite for accomplishing the development, flight, and post-flight analysis of a maximum number of these investigations, working within currently approved resources and schedules. This paper provides an overview of the Life Sciences Flight Experiments Program, and describes the approach being taken at NASA Headquarters in its planning and implementation. (Author)

A80-16452 Use of microspheres in measurement of regional blood flows during +Gz stress. M. H. Laughlin, J. W. Burns, and F. M. Loxsom (USAF, School of Aerospace Medicine, Brooks AFB; Trinity University, San Antonio, Tex.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 47, Dec. 1979, p. 1148-1156. 24 refs.

The use of the radiolabeled microsphere technique for the study of the effects of +G sub z acceleration on regional blood flow is examined and analysis of this technique in a high acceleration environment is presented. Chronically implanted, electromagnetic, aortic flow probes were used to determine the relationship between aortic blood flow velocity and +G sub z acceleration in conscious adult miniature swine. It was found that swine are able to compensate to acceleration levels equal to or below 7 G sub z, but exposure to +9 G sub z often resulted in unstable cardiovascular states and diminished cardiac outputs. It was also found that if aortic pressure and heart rate attain a steady state during acceleration, the application of the microsphere technique during +G sub z acceleration is theoretically valid. It is concluded the radiolabeled microsphere technique is as accurate in acceleration studies as it is in the laboratory work. A.T.

A80-16453 Adrenocortical function in rats chronically exposed to high altitude. L. C. Ou and S. M. Tenney (Dartmouth College, Hanover, N.H.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 47, Dec. 1979, p. 1185-1187. 22 refs. Grants No. NIH-HL-02888; No. NIH-HL-21159.

In rats exposed to a simulated altitude of 5,486 m for 3 mo, pituitary and adrenal glands hypertrophied and plasma levels of corticosterone increased more than threefold over sea-level controls. The in vitro rates of corticosterone production by the quartered adrenal gland were significantly enhanced, but the responsiveness of the adrenal gland to ACTH remained normal. (Author)

A80-16454 Influence of air velocity and heat acclimation on human skin wettedness and sweating efficiency. V. Candas, J. P. Libert, and J. J. Vogt (CNRS, Centre d'Etudes Bioclimatiques, Strasbourg, France). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 47, Dec. 1979, p. 1194-1200. 25 refs.

A80-16455 Plasma catecholamines and cardiovascular responses to cold- and mental activity. J. LeBlanc, J. Cote, M. Jobin, and A. Labrie (Université Laval, Quebec, Canada). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 47, Dec. 1979, p. 1207-1211. 15 refs.

A80-16456 Maximal work capacity of women during acute hypoxia. J. A. Wagner, D. S. Miles, S. M. Horvath, and J. A. Reyburn (California, University, Santa Barbara, Calif.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 47, Dec. 1979, p. 1223-1227. 29 refs. Grants No. AF-AFOSR-78-3534; No. NIH-AG-00021.

Six healthy women (22-34 yr) performed maximal bicycle work in a hypobaric chamber at sea level and at simulated altitudes of 2,130 and 3,050 m. Maximal oxygen uptake decreased 10 and 15% from sea-level values at 2,130 and 3,050 m, respectively. At these altitudes minute ventilation increased 17 and 22% respectively, a consequence of increased respiratory rate. Respiratory exchange ratios increased 10 and 14%, and oxygen pulse decreased 9 and 12%, respectively, at 2,130 and 3,050 m. Maximal blood lactates, heart rates, cardiac outputs, and plasma volume shifts were unaffected by these altitudes. Although during maximal work the percentage increases in minute ventilation, respiratory rate, and respiratory exchange ratio that resulted from altitude exposure were greater in women than those previously reported for men, the decrements in minute ventilation were comparable to those in men. The results show that relative to their performance at sea level, men and women have equal ability to perform maximal work at altitudes up to 3,050 m. (Author)

A80-16457 Effects of hypophysectomy and dexamethasone on rat adrenal response to microwaves. W. G. Lotz and S. M. Michaelson (Rochester, University, Rochester, N.Y.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 47, Dec. 1979, p. 1284-1288. 14 refs. Research supported by the U.S. Department of Energy; U.S. Food and Drug Administration Contract No. 74-111.

Circulating corticosterone levels were measured to compare the adrenocortical response to acute microwave exposure of normal, hypophysectomized, or sham-hypophysectomized rats. Plasma corticosterone levels in acutely hypophysectomized rats exposed to 60 mW/sq cm for 60 min were below control levels, indicating that the microwave-induced corticosterone response observed in normal, intact rats is dependent on ACTH secretion by the pituitary. In other groups of rats pretreated with dexamethasone before being exposed to microwaves for 60 min, the corticosterone response to a 40-mW/sq cm exposure was completely suppressed by doses equal to or greater than 3.2 micrograms dexamethasone/100 g body weight. However, the corticosterone response to a 70-mW/sq cm exposure was only partially suppressed by prior adminstration of 3.2 or 5.6 dexamethasone/100 g body weight. The evidence obtained in these experiments, in conjunction with the results of other experiments previously reported, is consistent with the hypothesis that the stimulation of the adrenal axis in the microwave-exposed rat is a systemic integrative process due to a general hyperthermia. (Author)

A80-16459 # Search for microorganisms in space (Poisk mikroorganizmov v kosmose). L. I. Rubenchik. Kiev, Izdatel'stvo Naukova Dumka, 1979. 132 p. 24 refs. In Russian.

The book is concerned with the interesting problem of existence of life in space. The latest information about space biology is provided. Other aspects of interest are discussed, such as the origin of life on the earth, the possibility of life genesis on other planets, and related problems. Particular attention is given to the search for microorganisms beyond the earth. S.D.

A80-16461 # Artificial sensory organs: Problems of modeling sensory systems (Iskusstvennye organy chuvstv: Problemy modelirovaniia sensornykh sistem). S. V. Fomin, E. N. Sokolov, and G. G. Vaitkiavichius. Moscow, Izdatel'stvo Nauka, 1979. 180 p. 111 refs. In Russian.

The book summarizes the results of 15-year research work using psychophysical, neurophysiological and cybernetic methods. The investigations were carried out according to the man-neuron-model scheme. The discussion focuses on the construction of artificial human and animal sensory organs. Analyzer systems, based on the mechanism of differential-sensitivity enhancement, encode the stimulus by the number of the channel of maximum excitation. Attention is given to the analyzers of intensity, color, orientation, directional lines and velocity of an object, along with its position in space. S.D.

A80-16463 Psychophysical studies of human-operator activity and instrumentation for these studies (Psikhofiziologicheskie issledovaniia deiatel'nosti cheloveka-operatora i ikh tekhnicheskoe obespechenie). Edited by V. G. Volkov. Moscow, Izdatel'stvo Nauka, 1979. 92 p.

A collection of papers is presented on such topics as error analysis of operator recognition of visual images, autogenic training as a method of stimulator operator work capacity, pursuit-tracking simulator with adaptive marker-trajectory program, and psychic models of hypo- and hyper-gravity. Consideration is also given to: psychophysiological characteristics of man under extreme conditions, spectral correlation analysis of physiological processes, and eye-movement reaction during tracking of discrete stimuli. B.J.

A80-16464 # Error dynamics of operator recognition of visual images (Dinamika oshibok raspoznavaniia operatorom zritel'nykh obrazov). M. V. Frolov, E. P. Sviridov, and L. S. Khachatur'iants. In: Psychophysical studies of human-operator activity and instrumentation for these studies. Moscow, Izdatel'stvo Nauka, 1979, p. 3-7. In Russian.

Experimental results are presented on human-operator recognition of noisy visual images (the numeral 1-9) in the case of prolonged (multihour and multiday) operator activity. The error dynamics of recognition is evaluated as a function of fatigue caused by prolonged activity and absence of feedback on the results of the activity; the error dynamics is also studied as a function of preliminary instruction, forming a subjective model of the experimental situation. Various classes of errors are identified, including signal miss, false alarm, and signal confusion. Physiological indices of operator functional state are correlated with operator performance indices. B.J.

A80-16465 # Autogenic training as a method of stimulating operator work capacity (Autogennaia trenirovka kak metod stimuliatsii rabotosposobnosti operatora). Iu. F. Isaulov. In: Psychophysical studies of human-operator activity and instrumentation for these studies. Moscow, Izdatel'stvo Nauka, 1979, p. 12-15. 6 refs. In Russian.

The paper discusses experimental data characterizing the influence of special autogenic training on operator work capacity, determined in operation with various types of control systems. The efficiency of autogenic training for various levels of work-related fatigue is evaluated. It is shown that autogenic training leads to full recovery of work capacity, depressed after continuous activity in the course of three days and nights. B.J.

A80-16466 # Pursuit-tracking simulator with adaptive pseudorandom program of marker trajectory (Imitator presleduiushchego slezheniia s adaptiruiushcheisia psevdosluchainoi programmoi traektorii metki). V. G. Volkov. In: Psychophysical studies of human-operator activity and instrumentation for these studies. Moscow, Izdatel'stvo Nauka, 1979, p. 15-20. 9 refs. In Russian.

The paper describes method and equipment for a two-coordinate pursuit tracking test. The trajectory of the pursued marker simulates the motion of a material point located in a viscous medium and undergoing collisions with other material points. Marker trajectory on the display screen is determined by the direction and force of collisions, which are randomly distributed, while the 'mean' velocity of the marker is given by the number of these collisions and depends on the performance of the operator. B.J.

A80-16467 # Physiological characteristics of psychic models of hypo- and hyper-gravity (Fiziologicheskie osobennosti psikhicheskikh modelei gipo- i gipergravitatsii). L. P. Grimak and N. N. Lebedeva. In: Psychophysical studies of human-operator activity and instrumentation for these studies. Moscow, Izdatel'stvo Nauka, 1979, p. 26-34. 6 refs. In Russian.

The paper presents results of a 10-day experiment using psychic models of hypo- and hyper-gravity in a strict hypodynamic framework. EKG, EEG, EMG, and ERG, and X-ray cardiographic studies are used to conduct a differential analysis of functional changes in the organism within the framework of a given psychic model. Some suggestions are made as to the elimination of negative functional changes associated with weightlessness under conditions of actual space flight. B.J.

A80-16468 # Investigation of the psychophysiological characteristics of man under extreme conditions (Izuchenie psikhofiziologicheskikh kharakteristik cheloveka v ekstremal'nykh usloviiakh). N. F. Luk'ianova. In: Psychophysical studies of human-operator activity and instrumentation for these studies. Moscow, Izdatel'stvo Nauka, 1979, p. 34-39. 6 refs. In Russian.

The paper reports results of the psychological testing of 33 subjects under extreme conditions, namely survival on life rafts in the open sea. It is found that preliminary testing of functional, psychological, and personality characteristics of subjects makes it possible to predict their behavior in the extreme situation. A 'negative' dynamics in the occurrence of principal psychic processes (i.e., attention and thinking) is disclosed. B.J.

A80-16469 # Analysis of the mean number of intersections of the zero level by physiological processes (Analiz srednego chisla peresechenii fiziologicheskim protsessom nulevogo urovnia). M. V. Frolov. In: Psychophysical studies of human-operator activity and instrumentation for these studies. Moscow, Izdatel'stvo Nauka, 1979, p. 40-46. 5 refs. In Russian.

The paper discusses the use of spectral and spectral correlation methods in the analysis of medical (e.g., EKG and EEG) data. Particular consideration is given to aspects of evaluating the mean number of zero-level intersections in relation to finite time of analysis and unknown spectral shape. Formulas are presented making it possible to evaluate the centroid from the mean number of intersections per unit time. B.J.

A80-16470 # Human operator eye-lid movement reaction during intense visual tasks involving the detection and tracking of visual signals (Vekodvigatel'naia reaktsiia u cheloveka-operatora pri napriazhennoi zritel'noi rabote no obnaruzheniiu i otslezhivaniiu zritel'nykh signalov). E. P. Sviridov. In: Psychophysical studies of human-operator activity and instrumentation for these studies. Moscow, Izdatel'stvo Nauka, 1979, p. 46-52. 13 refs. In Russian.

A80-16471 # Amplitude-phase discriminator with two-CRT oscillograph display (Amplitudno-fazovyi diskriminator s displeem na dvukhluchevom ostsillografe). G. I. Nikitin. In: Psychophysical studies of human-operator activity and instrumentation for these studies. Moscow, Izdatel'stvo Nauka, 1979, p. 53-58. In Russian.

The paper describes an amplitude-phase discriminator for the recording of brain neuron activity. The examined signal, the lower and upper levels of the discriminator, and the output impulse of the discriminator are simultaneously displayed on a two-CRT oscillograph. The structural and functional characteristics of the discriminator and the display are examined. B.J.

A80-16472 # **Determination of psychophysiological reaction norms of a pilot during work (Normirovanie psikhofiziologicheskikh reaktsii letchika v protsesse deiatel'nosti).** E. A. Kozlovskii, V. F. Zhernavkov, and F. A. Zubets. In: Psychophysical studies of human-operator activity and instrumentation for these studies. Moscow, Izdatel'stvo Nauka, 1979, p. 58-60. In Russian.

The paper investigates the possibility of developing group norms for evaluating the psychophysiological reaction level of pilots. It is found that individual differences in response can best be taken into account through regression analysis of the relationships between the initial value of a given psychophysiological indicator and its value during flight. A method for indicating levels of pilot nervous and emotional stress is described. B.J.

A80-16473 # **Method for generalizing operator performance factor evaluation in multidimensional tracking problems (Metodika obobshchennoi otsenki kachestva deiatel'nosti operatora v zadachakh mnogomernogo slezheniia).** E. A. Kozlovskii and V. F. Zhernavkov. In: Psychophysical studies of human-operator activity and instrumentation for these studies. Moscow, Izdatel'stvo Nauka, 1979, p. 60-62. In Russian.

A80-16474 # **Operator eye-movement reaction during tracking of discrete stimuli with random time and space distribution (Glazodvigatel'naia reaktsiia operatora pri slezhenii za diskretnymi stimulami so sluchainym vremennym i prostranstvennym raspredeleniem).** V. G. Volkov, N. N. Lebedeva, and V. M. Mashkova. In: Psychophysical studies of human-operator activity and instrumentation for these studies. Moscow, Izdatel'stvo Nauka, 1979, p. 80-85. In Russian.

A80-16480 # **Some aspects of processing physiological data (Nekotorye voprosy obrabotki fiziologicheskikh dannykh).** E. P. Levchenko and T. C. Sidorenko. In: Computational mathematics, programming and experimental-data processing. Kiev, Izdatel'stvo Naukova Dumka, 1979, p. 81-96. 13 refs. In Russian.

Some aspects of processing and programming somato-autonomic indices are discussed. Particular attention is given to the elimination of artifacts from the electrocardiogram, correction of arterial pressure, and the identification of basic indices from the overall respiration process. V.P.

A80-16575 A possible mechanism for the influence of electromagnetic radiation on neuroelectric potentials. R. J. MacGregor (Colorado, University, Boulder, Colo.). *IEEE Transactions on Microwave Theory and Techniques,* vol. MTT-27, Nov. 1979, p. 914-921. 30 refs.

This paper explores the idea that the electrical component of applied microwave and radiowave radiation might induce transmembrane potentials in nerve cells and, thereby, disturb nervous function and behavior. The paper estimates the transmembrane currents and potentials induced in nerve cells by applied electrical fields and currents. Estimates are made for steady and for oscillating stimulation. The primary conclusion is that intracranial electrical fields associated with low-intensity irradiation in the frequency range of 1MHz to 10GHz may induce transmembrane potentials of tenths of millivolts (or more) and that, therefore, such externally applied fields may disturb normal nervous function through this mechanism. The paper also presents a discussion which indicates that the induced transmembrane potential should exhibit a maximum at about 100 MHz. Although some researchers suggest that the direct mechanism explored here may not represent the main influence of microwaves and radiowaves on biological tissue, this model together with a recent model by Barnes and Hu (1977) suggest that the results so produced may indeed be significant. (Author)

A80-16602 Mathematical model of respiratory rhythm generation. V. M. Nekrasova, P. I. Kuznetsov, and V. A. Safonov (II. Moskovskii Gosudarstvennyi Meditsinskii Institut, Moscow, USSR). *(Akademiia Nauk SSSR, Doklady,* vol. 245, Apr. 21, 1979, p. 1315-1318.) *Soviet Physics - Doklady,* vol. 24, Apr. 1979, p. 246-247. 5 refs. Translation.

An attempt is made to construct a mathematical model of the respiration center (in the medulla oblongata), capable of interpreting the principal adaptive reactions of the respiration center in the generation of the respiration rhythm. The model is based on Nekrasov and Safonov's (1973) classification of respiration neurons and on Posin and Shul'pin's (1970) isolated-neuron model. V.P.

A80-16793 Time-resolved spectrometry of in vivo firefly bioluminescence emissions. J. D. Barry (USAF, Space and Missile Systems Organization, Los Angeles, Calif.), J. M. Heitman, and C. R. Lane (USAF, Avionics Laboratory, Wright-Patterson AFB, Ohio). *Journal of Applied Physics,* vol. 50, Nov. 1979, pt. 1, p. 7181-7185. 10 refs.

The optical emissions of in vivo bioluminescence pulses have been evaluated by time-resolved spectrometry for the first time. The firefly Photinus pyralis (Linnaeus) (Coleoptera: Lampyridae) was used as the test specimen. The time-resolved spectrometry has allowed evaluation of the intrapulse characteristics as well as those of the overall envelope. The light pulses were found to last 0.3-0.4 sec, have a nonsymmetrical wavelength envelope, have an emission peak near 585 nm, have apparently continuous emission over the interval 500-720 nm, emit a power of the order of 1 x 10 to the -6 W/pulse and have an intrapulse peak wavelength shift to shorter wavelengths during the pulse period. Time-resolved spectrometry is recommended for intrapulse evaluation of other bioluminescence systems. (Author)

A80-17054 * **Motion sickness susceptibility during rotation at 30 rpm in free-fall parabolic flight.** A. Graybiel (U.S. Navy, Naval Aerospace Medical Research Laboratory, Pensacola, Fla.). *Acta Astronautica,* vol. 6, Nov. 1979, p. 1481-1487. 6 refs. NASA Order T-9140-E.

To make comparisons with experimental motion sickness susceptibility in Skylab missions, subjects were tested during free fall in parabolic flight and in ground-based simulation tests. They were rotated at 30 rpm in a rotating litter chair (RLC) with head fixed, head swiveling left-to-right, or with 90 degree forward and return head and body movements. Stressful accelerations similar to those in the Skylab RLC were generated only in the tests aloft, where subjects who made 'forward and return' movements (generating cross-coupled angular accelerations) were substantially more prone to motion sickness than those with either head fixed or head swiveling left-to-right. However, with head swiveling, susceptibility was slightly higher in the laboratory than aloft. J.P.B.

A80-17059 # **Binocular and monocular stimuli for motion in depth - Changing-disparity and changing-size feed the same motion-in-depth stage.** D. Regan and K. I. Beverley (Dalhousie University, Halifax, Nova Scotia, Canada). *Vision Research,* vol. 19, no. 12, 1979, p. 1331-1342. 30 refs. National Research Council of Canada Grant No. A-0323; Grant No. AF-AFOSR-78-3711.

Although changing-size stimulation and changing-disparity stimulation can both produce a sensation of motion in depth, they act largely independently. The motion-in-depth sensation produced by changing-size can be cancelled by antagonistic changing-disparity stimulation. Again, a motion-in-depth aftereffect built up by inspecting a changing-size stimulus can be nulled either by changing-size stimulation or by changing-disparity stimulation. The relative effectiveness of changing-disparity and changing-size as stimuli for motion-in-depth sensation varies as follows: (1) changing disparity grows relatively more effective as velocity increases (according to a power law); (2) changing disparity grows relatively more effective as inspection time increases; (3) changing disparity grows relatively more effective as the linear horizontal width of the target decreases;

(4) the relative effectiveness of changing disparity and changing size shows marked intersubject variability (at least 80:1). But relative effectiveness does not depend on viewing distance except at very short ranges. (Author)

A80-17060 Processing of direction and magnitude by the saccadic eye-movement system. R. L. Hou and D. H. Fender (California Institute of Technology, Pasadena, Calif.). *Vision Research,* vol. 19, no. 12, 1979, p. 1421-1426. 9 refs. Grants No. NIH-NS-03627; No. NIH-RR-07003.

The function of the saccadic programming system has been studied using a doublestep target movement in two dimensions. The results of these experiments suggest the following hypotheses. The information processing in the programming of a saccade consists of direction computation and magnitude computation. If the new target-step arrives before the direction computation of the previous saccade is complete, this saccade will be cancelled. The partial program concerning the direction of the saccade is kept in a buffer memory; if the direction of the new saccade is not in a direction similar to the old one, this partial program has to be erased, which takes an extra 40-80 msec of processing time. There is a stage in which the direction of the saccade cannot be reprogrammed but the magnitude can still be reduced. In other words, the magnitude computation seems to finish after the direction computation. If the new target-step arrives after the computation of both direction and magnitude are complete, two full saccades will be observed. (Author)

A80-17067 Evaluation of heat convection and flow front influence on electrophoresis of biological substances in space flight conditions. V. R. Sharipova. *International Astronautical Federation, International Astronautical Congress, 30th, Munich, West Germany, Sept. 17-22, 1979, Paper 79-ST-17.* 10 p.

The paper deals with a few mathematical simulation problems of continuous flow electrophoresis during space flight, by taking the convection that occurs at that time into account. A qualitative study of the influence of convection in continuous-flow electrophoresis is made by employing a nonelliptic eddy system. It is shown that it is possible to carry out a parameter analysis of agent input coordinates from the given model on electrophoretic separation accuracy. C.F.W.

A80-17100 Radiation dose rate of a biological object from cosmic rays in the stratosphere and at the height of artificial earth satellites. N. G. Skriabin, Iu. G. Shafer, and I. I. Sosin. *(Kosmicheskie Issledovaniia,* vol. 17, May-June 1979, p. 478, 479.) *Cosmic Research,* vol. 17, no. 3, Nov. 1979, p. 397, 398. 7 refs. Translation.

The dose rate of cosmic ray radiation absorbed by a living organism in the stratosphere and at an altitude of 350 km has been estimated. The dose rate expended in ionization in the organism has also been determined. The equivalent dose rate absorbed at altitudes of 12 and 21 km at auroral latitudes is expected to be 0.71 and 1.56 mrem/hr, respectively. Assuming a geomagnetic rigidity of 1-10 GeV/sec, the calculated equivalent dose absorbed at an altitude of 350 km is 0.73 + or - 0.23 mrem/hr. C.K.D.

A80-17262 # Vertical stabilization of a quadriped walking machine (Vertikal'naia stabilizatsiia chetyrekhnogogo shagaiushchego apparata). B. A. Bordiug (Akademiia Nauk Ukrainskoi SSR, Institut Matematiki, Kiev, Ukrainian SSR). *Kibernetika i Vychislitel'naia Tekhnika,* no. 43, 1979, p. 37-48. 6 refs. In Russian.

Aspects of stabilizing a quadriped walking machine with weightless legs are discussed with emphasis on the synthesis of a vertical stabilization algorithm. General equations of motion and their linearized variants are obtained for the machine. The vertical stabilization problem is then treated as one of periodic-system optimization in an infinite time interval on the basis of a quadratic performance criterion. B.J.

A80-17285 # Active responses of the internal carotid artery to stretching (Ob aktivnykh reaktsiiakh vnutrennei sonnoi arterii na rastiazhenie). V. A. Mamisashvili, G. I. Mchedlishvili, and L. G. Ormotsadze (Akademiia Nauk Gruzinskoi SSR, Institut Fiziologii, Tiflis, Georgian SSR). *(Vsesoiuznaia Konferentsiia po Problemam Biomekhaniki, Riga, Latvian SSR, Apr. 1979.) Mekhanika Kompozitnykh Materialov,* Sept.-Oct. 1979, p. 873-877. 9 refs. In Russian.

The role of the myogenic mechanism in the regulation of cerebral circulation under variable systemic arterial pressure is examined. In vitro data obtained by various investigators for isolated segments of vascular smooth muscles are extrapolated to the actual intravascular pressure. It is shown that myogenic responses of the internal carotid artery are capable of providing only partial regulation of cerebral circulation at variable arterial pressure in the case of pronounced and rapid variation of intravascular pressure. V.P.

A80-17288 # In vivo investigation of the elastohysteresis properties of the aorta and its branches (Prizhiznennoe izuchenie uprugogisterezisnykh svoistv aorty i ee vetvei). V. P. Pirogov, V. D. Ivanova, N. A. Volkov, Iu. Iu. Zhuravlev, and M. I. Kyz'min (Kuibyshevskii Meditsinskii Institut; Kuibyshevskii Aviatsionnyi Institut, Kuibyshev, USSR). *(Vsesoiuznaia Konferentsiia po Problemam Biomekhaniki, Riga, Latvian SSR, Apr. 1979.) Mekhanika Kompozitnykh Materialov,* Sept.-Oct. 1979, p. 933-937. In Russian.

The method proposed in the present paper for calculating arterial flows is based on substituting ordinary linearized differential equations for the partial differential equations. A solution is obtained for the first harmonic of the volumetric flow rate. Good qualitative agreement of the model with the experiment is demonstrated. V.P.

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STAR ENTRIES

N80-12726 New York Univ., N. Y.
NUMERICAL SOLUTION OF A HYPERBOLIC SYSTEM OF CONSERVATION LAWS FOR BLOOD FLOW IN THE ARTERIAL TREE Ph.D. Thesis
David Moise Bellehsen 1979 130 p
Avail: Univ. Microfilms Order No. 7925440

A code for an arbitrary arterial tree was developed that can accommodate any prescribed physiological data. The partial differential equations which describe the flow of blood in the cardiovascular system are nonlinear. The flow is treated as one-dimensional. The equations form a hyperbolic system of conservation laws which are solved by the Lax-Wendroff method. Special cases of one branch and three branches were worked out numerically and analytically with computed results in the form of tables. As an application, a structured arterial tree was studied and some graphs are presented. The effect of varying the reflection coefficient is also discussed. Dissert. Abstr.

N80-12727 Ohio Univ., Athens.
HUMAN MUSCLE FIBER TYPES IN POWER LIFTERS, DISTANCE RUNNERS AND UNTRAINED SUBJECTS: A HISTOCHEMICAL AND ULTRASTRUCTURAL STUDY Ph.D. Thesis
Frederick Paul Prince 1979 39 p
Avail: Univ. Microfilms Order No. 7924429

Cellular aspects (fiber size and qualitative measures of contraction time and aerobic capacity via histochemistry) and sub-cellular (morphometric analysis of mitochondrial volume percent, lipid volume percent and Z-line width via electron microscopy) aspects of the vastus lateralis muscle, a major extensor of the knee joint, in male and female athletes and non-athletes were investigated. The cross-sectional area and metabolic profile was obtained for each fiber. The fibers were thus classified as slow-twitch-oxidative, fast-twitch-oxidative-glycolytic, and fast-twitch-glycolytic. Much individual variation is present in the percentages of histochemical fiber types and fiber cross-sectional area. Male and female fibers are similar in most respects. The major difference being that all 3 fiber types appear larger in males. Dissert. Abstr.

N80-12728 Utah Univ., Salt Lake City.
STATISTICAL REPRESENTATION OF ELECTROCARDIOGRAPHIC BODY SURFACE MAPS FOR FEATURE IDENTIFICATION DATA COMPRESSION AND CLASSIFICATION Ph.D. Thesis
Arnold Kerry Evans 1979 96 p
Avail: Univ. Microfilms Order No. 7924352

The development and evaluation of methods for providing accurate representation of ECG body surface potential map data are discussed. Identifying diagnostically important map features, providing data compression, and forming a basis for applying statistical pattern recognition techniques to map classification are studied. Dissert. Abstr.

N80-12729 Michigan Univ., Ann Arbor.
A POSTURAL MEASUREMENT SYSTEM FOR INDUCED BODY SWAY ASSESSMENT Ph.D. Thesis
Robert Owens Andres 1979 162 p
Avail: Univ. Microfilms Order No. 7925105

A microcomputer based stimulus delivery and response measurement system for the analysis of human sagittal plane body sway response to induced instabilities was developed. The system is called a postural measurement system (PMS). The PMS provides flexibility in stimulus delivery while assessing postural sway responses with known resolution. The PMS was implemented in a predesigned factorial experiment investigating both static and induced sinusoidal body sway responses of one healthy young male subject; PMS performance was monitored concurrently with the human sway responses. The spectrum of antero-posterior body sway during quiet stance was non-adaptive over the 45 minute test session. The waist swayed less than the shoulders; most sway displacement had frequency components less than .4 Hz. The lumbosacrum did not remain rigid during static sway as inverted pendulum body models assume. Dissert. Abstr.

N80-12730*# National Aeronautics and Space Administration. Pasadena Office, Calif.
SIMULTANEOUS MUSCLE FORCE AND DISPLACEMENT TRANSDUCER Patent Application
Cyril Feldstein (JPL), Gilbert W. Lewis (JPL), and Virgil H. Culler, inventors (to NASA) (JPL) Filed 30 Sep. 1977 12 p Sponsored by NASA
(NASA-Case-NPO-14212-1; US-Patent-Appl-SN-838308) Avail: NTIS HC A02/MF A01 CSCL 06B

A myocardial transducer for simultaneously measuring force and displacement within a very small area of myocardium is presented. Each branch of the forked transducer constitutes a low compliance tine for penetrating the heart. When the heart is penetrated, the surface membrane closes around indentations in the tines. A small piezoresistive element that converts a force into an electrical signal is bonded to one of the low compliance tines. A third high compliance tine is of a length that just pierces the surface membrane. Displacement of the myocardium in a direction in line with the two low compliance tines causes a deformation in curvature of the high compliance tine that is converted into an electrical signal by a second piezoresistive element. An electrode placed on the epicardium and referenced to the transducer provides an ECG with force and displacement measurements. NASA

N80-12731# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
DESIGN OF A MICROPROCESSOR BASED CARDIOTACHOMETER
D. Ratino, G. Potor, A. Marko, and C. Sharper Apr. 1979 39 p refs
(AF Proj. 6893)
(AD-A073105; AMRL-TR-79-21) Avail: NTIS HC A03/MF A01 CSCL 09/2

A microprocessor based cardiotachometer has been designed and fabricated in-house using 8080 Intel microcomputer hardware and assembly language software. The cardiotachometer accurately calculates and digitally displays beat-by-beat heart rate in beats per minute. The design incorporates standard semiconductor memory and I/O integrated circuits. Operational understanding does not require extensive microprocessor design background. In fact, the cardiotach's design provides excellent basic information in the use of microprocessors in the instrumentation field. GRA

N80-12732*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SINGLE PILOT SCANNING BEHAVIOR IN SIMULATED INSTRUMENT FLIGHT
Jack E. Pennington Oct. 1979 55 p refs
(NASA-TM-80178) Avail: NTIS HC A04/MF A01 CSCL 05I

A simulation of tasks associated with single pilot general aviation flight under instrument flight rules was conducted as a baseline for future research studies on advanced flight controls and avionics. The tasks, ranging from simple climbs and turns to an instrument landing systems approach, were flown on a fixed base simulator. During the simulation the control inputs, state variables, and the pilots visual scan pattern including point of regard were measured and recorded. Author

N80-12733# Hughes Aircraft Co., Culver City, Calif. Display Systems Lab.
DETECTION OF DIFFERENT TARGET TYPES IN REALISTIC TERRAIN Interim Report, Sep. 1978 - Jan. 1979
G. E. Corrick Mar. 1979 42 p refs
(Contract N60530-78-C-0240)
(AD-A072973; HAC-FR-79-27-676; HAC-Ref-E3900; NWC-TP-6107) Avail: NTIS HC A03/MF A01 CSCL 17/8

The effects of target and terrain characteristics on visual air-to-ground target acquisition were studied. Five target types--a portable bridge; a portable bridge with adjacent anti-aircraft artillery (AAA); a surface-to-air missile (SAM) site; a petroleum, oil, and lubricants (POL) supply dump; and a group of three tanks--were embedded into oblique aerial photos of real terrain at a simulated slant range of 1.6 km. Background scenes were selected to represent desert, desert/mountain, and rural terrain. Results of a search experiment showed that target type was the most important factor in determining acquisition performance, accounting for up to 40% of the experimental variance. The relative detectabilities of the target were found to group so that the bridge alone, the bridge with AAA site, and the SAM site were significantly easier to detect than the three tank group or POL site. Results are discussed in terms of the detectability of a target as related to the constraints on its possible scene location. Background was shown to be a significant effect, but accounted for about one-fourth as much of the variance as did target type. These results are compared to a previous similar study using multiple configurations of a single target type where background characteristics were shown to account for more variance. Implications for target acquisition modeling are discussed. GRA

N80-12734 Michigan Univ., Ann Arbor.
RATIONAL WAYS TO INCREASE PICTOGRAPHIC SYMBOL DISCRIMINABILITY Ph.D. Thesis
Paul Allan Green 1979 237 p
Avail: Univ. Microfilms Order No. 7925156

Several ways of increasing the discriminability of similar symbols were compared. Six alterations were considered; five modifications of symbol elements (changes in height to width ratio, strokewidth, rotation in the frontal plane, repetition, and filling in an enclosed area) and substitution of a new symbol (new prototype) for one member of a confusable pair. The last four changes were compared. To determine the effect of including confusable pairs of symbols in larger sets, symbols for several controls and displays (heater, air conditioner, vent, radio volume and tuning, exterior-lamp failure, and tire pressure) were developed. Suggestions for those symbols were drawn by 43 drivers in experiment two. Based on those drawings were several candidate symbols for each function. In the third experiment 62 drivers made magnitude estimates of how well each candidate's intended meaning was understood. From these data and existing standards a set of eight symbols was assembled. Dissert. Abstr.

N80-12735*# Georgia Inst. of Tech., Atlanta.
GUIDING THE DEVELOPMENT OF A CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM
Robert M. Mason, ed. (Metrics, Inc., Atlanta) and John L. Carden, ed. Nov. 1979 98 p refs Report on workshop held at NASA/Ames, 8-12 Jan. 1979
(Grant NsG-2323)
(NASA-CR-162452) Avail: NTIS HC A05/MF A01 CSCL 06K

The workshop is reported which was held to establish guidelines for future development of ecological support systems, and to develop a group of researchers who understand the interdisciplinary requirements of the overall program.

N80-12736*# Georgia Inst. of Tech., Atlanta.
EVALUATION OF A GROUND BASED MANNED DEMONSTRATION AS A MILESTONE IN CELSS DEVELOPMENT
In its Guiding the Development of a Controlled Ecological Life Support System Nov. 1979 p 8-75

Avail: NTIS HC A05/MF A01 CSCL 06K

The requirements for a ground based manned controlled ecological life support system demonstration are summarized for the following: nutrition and food processing, food production, waste processing, systems engineering and modeling, and ecology-systems safety. F.O.S.

N80-12737*# Georgia Inst. of Tech., Atlanta.
DEVELOPMENT REQUIREMENTS FOR A SUCCESSFUL GROUND BASED CELSS DEMONSTRATION
In its Guiding the Development of a Controlled Ecological Life Support System Nov. 1979 p 16-49 refs

Avail: NTIS HC A05/MF A01 CSCL 06K

Considerations critical to a ground based control demonstration were identified. The controlled ecological life support system technologies were assessed for nutrition and food processing, food production, waste processing, and systems engineering/modeling. F.O.S.

N80-12738*# Georgia Inst. of Tech., Atlanta.
RESEARCH RECOMMENDATIONS
In its Guiding the Development of a Controlled Ecological Life Support System Nov. 1979 p 51-69

Avail: NTIS HC A05/MF A01 CSCL 06K

The research and development sequences and priorities for CELSS development were established for each of the following areas: nutrition and food processing, food production, waste processing, systems engineering/modeling, and ecology-systems safety. F.O.S.

N80-12739*# Society of Automotive Engineers, Inc., New York. Bioenvironmental Systems Study Group.
EVALUATION AND COMPARISON OF ALTERNATIVE DESIGNS FOR WATER/SOLID-WASTE PROCESSING SYSTEMS FOR SPACECRAFT Final Report
J. M. Spurlock Jul. 1975 135 p refs
(Contract NASw-2439)
(NASA-CR-162492) Avail: NTIS HC A07/MF A01 CSCL 06K

Promising candidate designs currently being considered for the management of spacecraft solid waste and waste-water materials were assessed. The candidate processes were: (1) the radioisotope thermal energy evaporation/incinerator process; (2) the dry incineration process; and (3) the wet oxidation process. The types of spacecraft waste materials that were included in the base-line computational input to the candidate systems were feces, urine residues, trash and waste-water concentrates. The performance characteristics and system requirements for each candidate process to handle this input and produce the specified acceptable output (i.e., potable water, a storable dry ash, and vapor phase products that can be handled by a spacecraft atmosphere control system) were estimated and compared. Recommendations are presented. R.E.S.

N80-12740# Wisconsin Univ. - Milwaukee. Dept. of Systems Design.
SOME MODELS OF HUMAN ERROR FOR MAN-MACHINE SYSTEM EVALUATION Final Technical Report, 1 Jul. 1977 - 30 Dec. 1978
Marlin U. Thomas 15 May 1979 32 p refs Prepared in cooperation with Chrysler Corp., Detroit and Michigan Univ., Ann Arbor
(Contract N00014-77-C-0587)
(AD-A072838; TR-79-5) Avail: NTIS HC A03/MF A01 CSCL 05/8

A framework is presented for quantifying and modeling the occurance of human error events in a system. Decision tasks are classified according to the stochastic behavior of the relevant variables associated with the man-machine linkages. A general semi-Markov formulation is presented for describing transitions among error states. Closed form results for the time-between-errors are given through transform relationships for the case where interdecision times form a renewal process. An approximate time-between-error distribution is given that provides computational ease and compared well with some experimental data obtained from a laboratory human decision-making task. GRA

N80-13757*# Florida Inst. of Tech., Melbourne. School of Science and Engineering.
PHOTOSYNTHETIC CARBON REDUCTION BY SEAGRASSES EXPOSED TO ULTRAVIOLET A RADIATION Final Report
15 Sep. 1979 38 p refs
(Contract NAS9-15846)
(NASA-CR-160397) Avail: NTIS HC A03/MF A01 CSCL 06C

The seagrasses Halophila engelmannii, Halodule wrightii, and Syringodium filiforme were examined for their intrinsic sensitivity to ultraviolet-A-UV-A and ultraviolet-B-UV-B radiation. The effect of UV-A on photosynthetically active radiation (PAR) was also determined. Ultraviolet-A and ultraviolet-B were studied with emphasis on the greater respective environmental consequence in terms of seagrass distribution and abundance. Results indicate that an intrinsic sensitivity to UV-A alone is apparent only in Halophila, while net photosynthesis in Halodule and Syringodium seems unaffected by the level of UV-A provided. The sensitivity of Halophila to UV-A in the absense of (PAR) indicates that the photosynthetic reaction does not need to be in operation for damage to occur. Other significant results are reported. R.C.T.

N80-13758*# Texas A&M Univ., College Station. Dept. of Plant Sciences.
A PRELIMINARY RESEARCH PLAN FOR DEVELOPMENT OF A PHOTOSYNTHETIC LINK IN A CLOSED ECOLOGICAL LIFE SUPPORT SYSTEM Final Report
Page W. Morgan Nov. 1979 135 p refs
(Contract NAS9-15873)
(NASA-CR-160399; Rept-79-556) Avail: NTIS HC A07/MF A01 CSCL 06C

The use of higher plants in a closed ecological life support system for long duration space missions involving large numbers of people is considered. The approach to planning and developing both the habitat for a long term space mission and closed ecological life support systems are discussed with emphasis on environmental compatibility and integrated systems design. The requirements of photosynthetic processes are summarized and evaluated in terms of their availability within a closed ecological life support environment. Specific references are recommended as a data base for future research on this topic. R.C.T.

N80-13759*# General Electric Co., Houston, Tex.
SYSTEM PARAMETERS FOR ERYTHROPOIESIS CONTROL MODEL: COMPARISON OF NORMAL VALUES IN HUMAN AND MOUSE MODEL
15 Dec. 1979 29 p refs
(Contract NAS9-15487)
(NASA-CR-160401; TIR-741-LSP-8024) Avail: NTIS HC A03/MF A01 CSCL 06C

The computer model for erythropoietic control was adapted to the mouse system by altering system parameters originally given for the human to those which more realistically represent the mouse. Parameter values were obtained from a variety of literature sources. Using the mouse model, the mouse was studied as a potential experimental model for spaceflight. Simulation studies of dehydration and hypoxia were performed. A comparison of system parameters for the mouse and human models is presented. Aside from the obvious differences expected in fluid volumes, blood flows and metabolic rates, larger differences were observed in the following: erythrocyte life span, erythropoietin half-life, and normal arterial pO2. R.E.S.

N80-13760# State Univ. of New York, Stony Brook.
DETERMINING BIOLOGICAL FINE STRUCTURE BY DIFFERENTIAL ABSORPTION OF SOFT X-RAY
B. J. Panessa-Warren and J. B. Warren (BNL) Jun. 1979 23 p refs Presented at the Conf. on Ultrasoft X-Ray Microscopy, N.Y., 13 Jun. 1979 Submitted for publication
(Contract EY-76-C-02-0016)
(BNL-26282; CONF-790674-3) Avail: NTIS HC A02/MF A01

The use of soft X-ray contact microscopy in examining histo-chemically treated human tissue embedded in plastic and exposed as unstained thin sections is demonstrated. Preliminary data revealed that the histochemical reaction product, and the unstained biological fine structure of the surrounding tissues can be clearly imaged. Hydrated proteoglycan aggregates were examined. Proteoglycans are an essential component of the organic matrix of cartilage, and play a primary role in the retention and maintenance of extracellular water. To avoid any artifacts due to the introduction of exogeneous materials, and examine the proteoglycan aggregates in their hydrated, natural configuration, contact X-ray images of isolated proteoglycan aggregates in water were made. DOE

N80-13761 Johns Hopkins Univ., Baltimore, Md.
THE EFFECTS OF CONTEXT ON THE STRUCTURE OF PAIN Ph.D. Thesis
Mark Harold Bradshaw 1979 138 p
Avail: Univ. Microfilms Order No. 7924603

Multidimensional scaling (MDS) was used to determine whether the structure of a set of pain descriptors varied as a function of the area of the body to which those descriptors referred. Three body areas (head, arms and legs, and torso) were chosen, and a set of 13 words were found which were judged by subjects to be highly applicable to the description of pain in all three body areas. These words, plus a few body-area-specific words, were used as stimuli in four MDS studies. In each of the studies pain descriptors were judged in the context of a specific body area. It was concluded that differences in the structure of the pain descriptors across different body areas were minimal to nonexistant. Thus, this research supports the view that a single taxonomy of pain descriptors can represent the major pain qualities in different parts of the body and that MDS is a good method for establishing such a taxonomy.
Dissert. Abstr.

N80-13763 Virginia Univ., Charlottesville.
MODELING STUDIES OF THE PRESSURE-FLOW RELATIONSHIP OF THE CENTRAL AIRWAYS Ph.D. Thesis
David Burkman Reynolds 1978 249 p
Avail: Univ. Microfilms Order No. 7928032

The spacing of junctions that control the pressure flow relation of the bronchial tree was investigated. A mathematical model simulating these relations was developed. Airway models included single bifurcations, bifurcating networks, and a latex airway reproduction of a dog lung. The total flow rate of water and aqueous solutions of sucrose and sodium carboxymethyl cellulose and the static pressure at selected locations of the airway models was measured for steady and unsteady, inspiratory, and expiratory flow corresponding to tracheal Reynolds number in the range 1000-10,000. A dimensionless form of the Rohrer equation was used to simulate the data and to partition the total loss into that of an individual bifurcation. By appropriate sealing relationships, the results with aqueous solutions were extended to the flow of air. Dissert. Abstr.

N80-13764# Clemson Univ., S.C. Coll. of Engineering.
RESUSCITATION FROM HYPOTHERMIA: A LITERATURE REVIEW Final Report, 17 Jan. 1978 - 14 Feb. 1979
R. Michael Harnett, Fred R. Sias, and James R. Pruitt 14 Feb. 1979 64 p refs
(Contract DOT-CG-72074-A)
(AD-A069093; USCG-D-26-79) Avail: NTIS HC A04/MF A01 CSCL 06/5

This report summarizes medical and scientific aspects of the general literature debate over rapid versus slow rewarming and selected specific rewarming approaches. The specific approaches were selected largely on the basis of being difficult to evaluate with in vivo experiments with human subjects. Findings in basic medical literature, research reports and clinical medical literature are analyzed leading to recommendations of the suitability of each specific therapy for use as a first-aid treatment in the field. GRA

N80-13765# Army Research Inst. of Environmental Medicine, Natick, Mass.
DEVELOPMENT AND DESCRIPTION OF A DEVICE FOR STATIC STRENGTH MEASUREMENT IN THE ARMED FORCES EXAMINATION AND ENTRANCE STATION

Joseph Knapik, Dennis Kowal, Patrick Riley, James Wright, and Michael Saoco 9 Jan. 1979 44 p refs
(AD-A068684; USARIEM-T-2/79) Avail: NTIS HC A03/MF A01 CSCL 06/14

A device for muscular strength measurement designed for possible use in the AFEES is presented. Muscle groups involving the upper body, legs and trunk, were selected for measurement as being most representative of the functional muscle groups most relevant to the Army's needs. The isometric (static) mode of testing was selected due to its simplicity of administration, reliability and reduced susceptibility to motivational influences. Biomechanical factors including subject-machine couplings, anatomical angles and minimization of synkinetic movement patterns are considered. The apparatus and calibration techniques are described. Standardized postures, anatomical angles and instructions are included. Reliability coefficients of 0.97, 0.92 and 0.83 were obtained for the upper body, legs and trunk respectively. Descriptive statistics and histograms for a representative population are included. GRA

N80-13766# Coast Guard, Washington, D.C. Office of Research and Development.
RELIABILITY, VALIDITY AND APPLICATION OF AN IMPROVED SCALE FOR ASSESSMENT OF MOTION SICKNESS SEVERITY Final Report, Apr. 1978 - May 1979
S. F. Wiker, R. S. Kennedy (Naval Aviation Med. Res. Lab., New Orleans), M. E. McCauley (Human Performance Res., Inc., Goleta, Calif.), and R. L. Pepper (Naval Ocean Systems center, Kaila, Hawaii) May 1979 29 p refs
(AD-A069130; USCG-D-29-79) Avail: NTIS HC A03/MF A01 CSCL 06/5

Three sea going vessels steamed side-by-side through slight seas off the coast of Oahu, Hawaii. A four-hour octagon was transmitted twice each day for three consecutive days while motion sickness symptomatology was recorded from eighteen enlisted men who alternated among the vessels. Dramatic differences in illness severity were obtained, whether comparisons were made using objective evidence of vomiting episodes, or subjective reporting of symptoms on questionnaires. Reliability of this scoring method was excellent ($r = .95$). In addition to face and construct validity, evidence is presented of the predictive validity of the scoring method in a separate octogonal steaming experiment; using a 95 ft Coast Guard Patrol Boat in an equivalent experimental paradigm. This study showed significant covariance between the magnitude of motion sickness symptomatology and the encounter direction of the vessel to the primary swell ($p < .01$). Additional significant correlations were found between sickness severity and test subject concentration, fatigue, urine production and urine specific gravity. The majority of these relationships would not have been disclosed had only the dichotomous criterion of vomit/nonvomit been employed in assessing motion sickness severity. Implications of these data as design criteria for marine vehicles are discussed. GRA

N80-13767# California Univ., Berkeley. Lawrence Berkeley Lab. Div. of Biology and Medicine.
EFFECTS OF IONIZING RADIATION ON THE LIGHT SENSING ELEMENTS OF THE RETINA Ph.D. Thesis
Michael J. Malachowski Jul. 1978 236 p refs
(Contract W-7405-eng-48)
(LBL-5683) Avail: NTIS HC A11/MF A01

Morphological and physiological effects of particles of high linear energy transfer on the retina, in comparison with X-ray effects were investigated. The particles used were accelerated atomic nuclei of helium, carbon, and neon at kinetic energies of several hundred MeV/nucleon. For morphological studies, scanning and transmission electron microscopy and light microscopy were used. Physiological studies consisted of autoradiographic data of the rate of incorporation of labeled protein in the structures (opsin) of the outer segment of visual cells. Structural changes were found in the nuclei, as well as the inner and outer segments of visual cells, rods and cones. At a low of dose of 10 rad, X-ray and helium had no statistically significant morphological effects, but carbon and neon beams did cause significant degeneration of individual cells, pointing to the existence of a linear dose effect relationship. Other significant results are reported. DOE

N80-13768# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
APPARATUS FOR MEASUREMENT OF TISSUE COMPLIANCE Final Report
Wolfgang Gerhard, Wolfgang Hepp, and Karl-Frieder Sahm Bonn Bundesmin. fuer Forsch. u. Technol. Nov. 1978 60 p refs In GERMAN; ENGLISH summary
(Contracts BMFT-WRT-1076; DFVLR-BPT-01-00-096)
(BMFT-FB-W-78-05) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 12,60

It is supposed that the compliance of tissues under weightlessness produces changes in the distribution of fluids in the tissues which can be observed in space. These changes give rise to changes in the tissue thickness; analogous thickness variations can be produced by application of external pressure to tissue. A concept for measuring these variations in tissue thickness is studied. After a critical analysis of the experimental situation, possible procedures for thickness measurement are discussed. As a suitable procedure, an ultrasonic echo method was chosen which works with impulses similar to shock waves. For the application of pressure to the tissue a special pressure chamber was developed. Problems connected with coupling of the chamber and the ultrasonic probe to the tissue surface were solved. A laboratory test of the measuring equipment gives results which are reproducible and of adequate precision. Author (ESA)

N80-13769*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF NOISE SPECTRA AND A LISTENING TASK UPON PASSENGER ANNOYANCE IN A HELICOPTER INTERIOR NOISE ENVIRONMENT
Sherman A. Clevenson and Jack D. Leatherwood Dec. 1979 26 p refs
(NASA-TP-1590; L-13233) Avail: NTIS HC A03/MF A01 CSCL 05I

The effects of helicopter interior noise on passenger annoyance were studied. Both reverie and listening situations were studied as well as the relative effectiveness of several descriptors (i.e., overall sound pressure level, A-weighted sound pressure level, and speech interference level) for quantifying annoyance response for these situations. The noise stimuli were based upon recordings of the interior noise of a civil helicopter research aircraft. These noises were presented at levels ranging from approximately 68 to 86 dB(A) with various gear clash tones selectively attenuated to give a range of spectra. Results indicated that annoyance during a listening condition is generally higher than annoyance during a reverie condition for corresponding interior noise environments. Attenuation of the planetary gear clash tone results in increases in listening performance but has negligible effect upon annoyance for a given noise level. The noise descriptor most effective for estimating annoyance response under conditions of reverie and listening situations is shown to be the A-weighted sound pressure level. R.E.S.

N80-13770*# General Electric Co., Houston, Tex. Apollo Systems Dept.
ANALYSIS OF METABOLIC ENERGY UTILIZATION IN THE SKYLAB ASTRONAUTS
J. I. Leonard 19 Dec. 1977 97 p
(Contract NAS9-14523)
(NASA-CR-160402; TIR-741-MED-7018) Avail: NTIS HC A05/MF A01 CSCL 05H

Skylab biomedical data regarding man's metabolic processes for extended periods of weightlessness is presented. The data was used in an integrated metabolic balance analysis which included analysis of Skylab water balance, electrolyte balance, evaporative water loss, and body composition. A theoretical analysis of energy utilization in man is presented. The results of the analysis are presented in tabular and graphic format. R.E.S.

N80-13771*# General Electric Co., Houston, Tex. Apollo Systems Dept.
SKYLAB WATER BALANCE ERROR ANALYSIS
J. I. Leonard 5 May 1977 39 p refs
(Contract NAS9-14523)
(NASA-CR-160403; TIR-782-LSP-7006) Avail: NTIS HC A03/MF A01 CSCL 05H

Estimates of the precision of the net water balance were obtained for the entire Skylab preflight and inflight phases as well as for the first two weeks of flight. Quantitative estimates of both total sampling errors and instrumentation errors were obtained. It was shown that measurement error is minimal in comparison to biological variability and little can be gained from improvement in analytical accuracy. In addition, a propagation of error analysis demonstrated that total water balance error could be accounted for almost entirely by the errors associated with body mass changes. Errors due to interaction between terms in the water balance equation (covariances) represented less than 10% of the total error. Overall, the analysis provides evidence that daily measurements of body water changes obtained from the indirect balance technique are reasonable, precise, and relaible. The method is not biased toward net retention or loss. R.E.S.

N80-13772# Bendix Corp., Davenport, Iowa. Instruments and Life Support Div.
ANTI-SUFFOCATION VALVE BENDIX TYPE NO. 3267010-0101 Final Report
J. Mientus, R. Cramer, and J. Dunbar 16 Apr. 1979 26 p refs
(Contract N62269-76-C-0214)
(AD-A068927; NADC-79010-60) Avail: NTIS HC A03/MF A01 CSCL 06/11

The oxygen supply currently located in the RSSK (Rigid Seat Survival Kit) provides the aircrew member with an emergency source of oxygen in the event of an in-flight failure of the aircraft oxygen system, during parachute descent, or in the event of aircraft ditching. An inherent danger in the system is the suffocation of an unconscious aircrew member who cannot remove his mask in the event the emergency oxygen supply becomes depleted or is malfunctioning. The protection envelope currently provided the aircrew member will be greatly enhanced through the incorporation of an anti-suffocation valve, providing the capability of breathing ambient air when oxygen from the emergency supply is no longer available. The valve overcomes the danger of an aircrew member unknowingly breathing air during normal in-flight operation, and prevents the entrance of water during an underwater or flotation condition. GRA

N80-13773# ITT Electro-Optical Products Div., Roanoke, Va.
AVIATION NIGHT VISION GOGGLE Final Report, 13 Jul. 1977 - 16 Mar. 1979
Pete Hartman 29 Mar. 1979 54 p
(Contract DAAK70-77-C-0179)
(AD-A073296) Avail: NTIS HC A04/MF A01 CSCL 17/8

The intent of this program was to demonstrate the feasibility of a lightweight goggle which possessed a unique 'flip-up' capability and utilized the existing Generation II or (Gen III) lightweight image intensifier assembly. The contract consisted of the design, fabrication, test, and delivery of two Aviation Goggles with two minor design iterations. The contract modification consisted of retrofitting two sets of goggles with lightweight image intensifier. GRA

N80-13774# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Unternehmensbereich Raumfahrt.
SPACELAB ENVIRONMENT INVESTIGATION BY MASS SPECTROMETER Final Report
Gunther Kupfahl and Rolf Maisch Bonn Bundesmin. fuer Forsch. u. Technol. Nov. 1978 70 p refs In GERMAN; ENGLISH summary
(Contracts BMFT-WRT-1075; DFVLR-BPT-01-00-016)
(BMFT-FB-W-78-02) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 14,50

The aptness of the extremely clean environment onboard Spacelab to scientific and technological experimentation is considered. The limitations of this cleanliness due to leakage and outgassing from the Shuttle-Spacelab system are defined. Contamination control, mandatory for certain missions, is described. The use of mass spectrometers, being best suited to this purpose, as measuring instruments is recommended. Type and preliminary specifications for this equipment are given. It is pointed out that this instrument can be used simultaneously for aeronomic research, because the undisturbed and contaminated atmosphere can be separated by an energy discriminator. A set of control mechanisms is suggested to cover at least one halfsphere of the space around is Spacelab. Author (ESA)

N80-13775# Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).
A FIELD OF VIEW SIMULATOR EQUIPPED FOR PERSPECTIVE TRANSFORMATION ON A TELEVISION RASTER [EIN SICHTSIMULATOR MIT PERSPEKTIVISCHER VERZEICHNUNG DES RASTERS VON FERNSEHBILDERN]
H. Heising Dec. 1977 78 p refs In GERMAN; ENGLISH summary
(FB-34) Avail: NTIS HC A05/MF A01; Forschungsinst. fuer Anthropotech., Meckenheim, West Ger. DM 10

For ergonomical investigations of visual simulation problems a system which simulates the outside visual environment as seen by an aircraft pilot was developed. Television technology was used for storage and display of moving images because of its low cost and technical maturity. High accuracy and fast computation requirements are accomplished with a specially built analog computing network which is described in detail. This visual simulation technique is applicable to a wide range of tasks and visual situations in which perspective transformations of images are desired. Author (ESA)

N80-13776# Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).
ON THE OPTIMIZATION OF SPRING ELASTICITY, DAMPING, AND INERTIA EFFECTS ON THE SPRING LOADING OF A CONTROL STICK [ZUR OPTIMIERUNG VON FEDER-, DAEMPFUNGS- UND MASSEANTEILEN BEIM BEWEGUNGSWIDERSTAND EINES LENKKNUEPPELS]
W. Krueger May 1978 41 p refs In GERMAN; ENGLISH summary
(FB-37) Avail: NTIS HC A03/MF A01; Forschungssinst. fuer Anthropotech., Meckenheim, West Germany DM 10

In manual control the performance of the human operator can be influenced by the design of controls. Deflection-resistance characteristics are of special interest due to the movement resistance of the control. In order to investigate several reaction forces of a joystick, a series of experiments was conducted. The optimal control forces as a combination of spring force (0, 1, 2, 3.5 N/cm) viscous damping (0, 0.2, 0.35 N/cm/sec), and inertia (0, 2 kg) were obtained. A second and third order tracking task (simplified longitudinal and lateral dynamics of an airplane) was used. Results show that only spring force (1.0 to 3.5 N/cm), can improve tracking performance. Damping and inertia effects were negative using a low spring stiffness of 1.0 N/cm. Self adjusted stiffness by well trained subjects was 1.7 N/cm.
Author (ESA)

N80-13777# Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).
A COMPARISON OF CONTROL SIMULATORS HAVING FORCE INPUTS AND DISPLACEMENT FEEDBACK. APPLICATIONS TO THE MANUAL CONTROL OF UNDERWATER VEHICLES [UNTERSUCHLING EINES BEDIENELEMENTS MIT KRAFTEINGABE UND WEGRUECKMELDUNG BEI DER MANNELLEN LENKUNG VON UNTERWASSERFAHRZEUGEN]
H. E. Boller and W. Krueger May 1978 32 p refs In GERMAN; ENGLISH summary
(FB-38) Avail: NTIS HC A03/MF A01; Forschungsinst. fuer Anthropotech., Meckenheim, West Germany DM 10

In manual control, human operator performance can be improved by kinesthetic feedback of vehicle dynamic behavior. In a low-frequency system, the advantage of kinesthetic feedback may be reduced by slow system reactions. Two different single axis control yokes, each with the functional capability of either pure displacement inputs of force input with a displacement feedback as a kinesthetic display of vehicle response were compared. Eight subjects were used in controlling a simulated submarine while making several changes in depth. Results did not support a preference for the force yoke with a displacement

feedback. It is recommended not to use this type of control device in steering such a one-axis low-frequency system.
Author (ESA)

N80-13778# Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).
ON THE PROBLEM OF SPRING LOADED RESISTANCE TO SIMPLE AND COMPLEX POSITIONING OF A CONTROL STICK [ZUM PROBLEM DES BEWEGUNGS- WIDERSTANDS BEI EINFACHEN UND KOMPLEXEN STELLBEWEGUNGEN DES ARMES]
G. Rothbauer Oct. 1978 150 p refs In GERMAN; ENGLISH summary
(FB-40) Avail: NTIS HC A07/MF A01; Forschungsinst. fuer Anthropotech., Meckenheim, West Germany DM 10

To provide good proprioceptive feedback in a manual control device for a designation task, spring resistance of a joystick was optimized by using the psychophysical method of cross modality matching. Designation with zero and first order systems showed that the coarse adjustment was insensitive to stick and certain task parameters, although it was influenced by some biomechanical parameters and the anticipated demands of the final control positioning. Only the more difficult fine adjustment is sensitive to parameter alteration and therefore suitable for optimization attempts. The strong centering of the stick by nonlinear degressive spring resistance facilitates fine adjustment. Through this, total adjustment time with the first order system is reduced by more than 30%, compared to a linear resistance. Tracking experiments confirm the usefulness and preference of nonlinear spring resistance.
Author (ESA)

N80-13779# Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).
THE AUTOMOBILE DRIVING SIMULATOR FOR ANTHROPOGENIC RESEARCH
E. Donges Jul. 1978 48 p refs In GERMAN; ENGLISH summary uft der fahrsimulator des forschungsinstituts fuer anthropotechnik
(FB-41) Avail: NTIS HC A03/MF A01; Forschungsinst. fuer Anthropotech., Meckenheim, West Germany DM 10

The setup of a driving simulator which is used for the investigation of human behavior in guiding motor vehicles is described. The front part of a fully equipped car body serves as a mock-up for the driver. The simulation of lateral and longitudinal vehicle dynamics is based on simplified motion equations and characteristics implemented on a digital process computer. An electronic visual outside world simulation generates a synthetic, central perspective view of a two lane road according to vehicle motions. The driving noise is composed of simulated engine, tire, and wind noise. The simulator mock-up can be rotated in degrees of freedom (roll and pitch) by an electro-hydraulic servosystem. Steering wheel forces are provided by an electromechanical servosystem corresponding to a static characteristic with hysteresis. The data transfer between the simulator components, the simulation mode control, and data acquisition is coordinated by a digital process computer which also solves the dynamic equations of vehicle motion in real time.
Author (ESA)

N80-13780# Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).
ON THE INTERACTION BETWEEN SYSTEM AND TASK PARAMETERS THROUGH CONTINUOUS MANUAL CONTROL [INTERAKTION VON SYSTEM- UND AUFGABENPARAMETERN BEI KONTINUIERLICHER MANUELLER REGFLUNG]
G. Rothbauer Mar. 1979 39 p refs In GERMAN; ENGLISH summary
(FB-42) Avail: NTIS HC A03/MF A01; Forschungsinst. fuer Anthropotech., Meckenheim, West Germany. DM 10

Experiments in pursuit tracking with a first order system were conducted. Tracking performance, depending on the forcing function bandwidth, the system parameters control gain and control spring resistance as well as their interactive influence, was investigated. These experiments, giving six subjects the possibility of self adjusting the system parameters according to the task, resulted in parameter settings which required an intraindividually constant average control force for the accomplishment of the task. It is noted that the average control deflection varied considerably. Results are interpreted according to the importance of proprioceptive force-feedback in continuous control.
Author (ESA)

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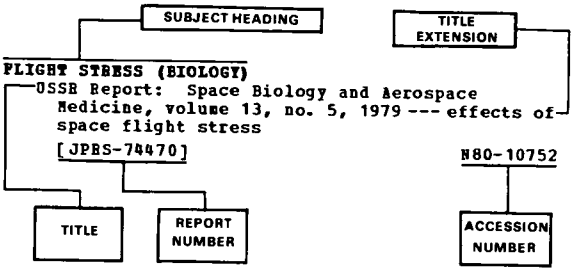

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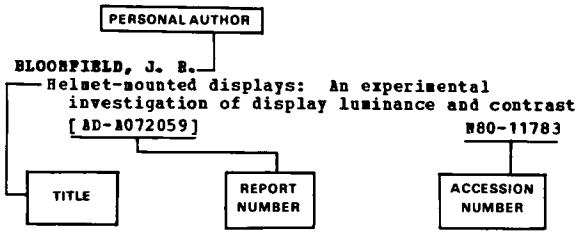

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1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
NASA-SP-7011 (204)		

4. Title and Subtitle	5. Report Date
AEROSPACE MEDICINE AND BIOLOGY A Continuing Bibliography (Supplement 204)	March 1980
	6. Performing Organization Code
7. Author(s)	8. Performing Organization Report No.
	10. Work Unit No.
9. Performing Organization Name and Address National Aeronautics and Space Administration Washington, D. C. 20546	11. Contract or Grant No.
	13. Type of Report and Period Covered
12. Sponsoring Agency Name and Address	14. Sponsoring Agency Code

15. Supplementary Notes

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17. Key Words (Suggested by Author(s))	18. Distribution Statement
Aerospace Medicine Bibliographies Biological Effects	Unclassified - Unlimited

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